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Food Safety
and Inspection
Service

Science

COMPOUND EVALUATION and ANALYTICAL CAPABILITY NATIONAL RESIDUE PROGRAM PLAN 1987

SCIENCE
FOOD SAFETY AND INSPECTION SERVICE

COMPOUND EVALUATION AND ANALYTICAL CAPABILITY 1987 NATIONAL RESIDUE PROGRAM PLAN

Table of Contents

January, 1987

PREFACE

Purpose of Document

This document—now in its fourth edition—details the activities of the Food Safety and Inspection Service (FSIS) in its evaluation of compounds that may be present in meat and poultry and its development and implementation of analytical methods for detecting those compounds; it includes the Annual Residue Plan. The document serves as a reference source for those concerned with food safety and with FSIS activities in that area.

Changing Field

The information contained in this document represents the state of FSIS Science affairs as of September 1, 1986. Past revisions and those expected in the future reflect the dynamic nature of a scientific and technological field that is constantly in flux.

Address for Comments

Please send comments regarding this or other aspects of the document to:

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Washington, DC 20250

January, 1987

Section 1

Section 2 Section 2 is an Introduction to the basic activities of the Residue Program.

Section 3 Section 3 includes in this edition "Criteria for Compound Evaluation," which describes the procedure followed by FSIS in evaluating compounds for inclusion in the National Residue Program, and the "List of Compounds Considered." The list was compiled by reference to the separate entries in the Code of Federal Regulations (CFR) and the New Animal Drug Application (NADA) listing of the Food and Drug Administration. The list provides the compound name and appropriate CFR or NADA references. NADA references are used for approved animal drugs not listed in the CFR. The third column indicates whether the compound was mentioned in the 1979 General Accounting Office (GAO) Report, "Problems in Preventing the Marketing of Raw Meat and Poultry Containing Potentially Harmful Residues" (Publication number HRD-79-10). The fourth column gives the ranking assigned to the compound in the National Residue Program. Also included is a list of cross-referenced compounds.

Section 4 Section 4 is a list of tolerance and action levels for the compounds.

Section 5 Section 5 defines the types of methods used by FSIS to conduct analyses and their suitability for regulatory use; defines key terms used to describe the methods; and lists the analytical methods for compounds in alphabetical order.

Section 6 Section 6 is an historical chart indicating the compounds included in the National Residue Program during a ten-year period and the specific years in which a compound was included. The methods used for some compounds in this section, identified by footnotes, are no longer considered suitable for regulatory use.

Section 7 Section 7 is the National Residue Program Plan for the calendar year 1987, which describes domestic and import program activities. The plan is a guide based on current information, assessment of precedence for testing, and FSIS analytical capability. It is dependent upon our having full staffing and is therefore affected by loss of personnel. The plan will be modified during the year as new information alters the original assessment.

Section 2

INTRODUCTION

The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) as part of its National Residue Program collects samples of meat and poultry at slaughtering establishments under its inspection authority and from import shipments at the ports of entry. The samples are analyzed for the presence of unacceptable residue levels of pesticides, animal drugs, and other potentially hazardous chemicals that may contaminate meat and poultry. These activities are carried out as part of the Agency's responsibilities under the Federal Meat Inspection Act and the Poultry Products Inspection Act to ensure that USDA-inspected products in commerce are safe, wholesome, and free of adulterating residues.

Testing

Residue testing of animals slaughtered in the United States is subdivided into three major activities: monitoring, surveillance, and exploratory projects.

Monitoring is designed to provide profile information on the occurrence of residue violations in specified animal populations on an annual, national basis. The current focus of monitoring is on violations; therefore, only compounds with established safe limits—tolerance or action levels—are considered. Compounds are selected for monitoring based on risk profiles and the availability of laboratory methodology that is suitable for regulatory purposes. Monitoring information is obtained through a statistically based selection of random samples from healthy-appearing animals under inspection; area monitoring may be conducted where a localized potential problem appears. The information generated from monitoring is reviewed periodically to assist in the allocation of Agency resources.

In addition to profile information, the monitoring program provides a basis for further action. In particular, the results are used to identify producers marketing animals with violative levels of residues. When such producers subsequently offer animals for slaughter, the animals will be subjected to surveillance sampling and testing until compliance is demonstrated. Other auxiliary uses of the data are to indicate incidences and levels of residue occurrence, to evaluate residue trends, and to identify problems within the industry where educational or other corrective efforts may be needed. Thus monitoring not only gathers information, but also assists in deterring practices that lead to violative residues.

Monitoring samples collected by inspectors at slaughtering plants are sent for analysis either to one of three FSIS field laboratories or, as needed, to a laboratory under contract to FSIS. The results are usually reported within 8 days after arrival at the laboratory. In most cases, the product will have passed into consumer channels and become untraceable.

Because of this pragmatic limitation, some animals containing violative residues inevitably pass into consumer channels, in spite

of the agency's efforts to limit this occurrence as much as possible. The consequences to human health, however, are minimal as long as the violative rate is low. Tolerances and action levels represent the maximum residue concentrations safe for daily consumption over a lifetime. Occasional consumption of products with slightly higher residues is unlikely to result in adverse health effects.

Surveillance is designed to investigate and control the movement of potentially adulterated products. The sampling is biased and is directed at particular carcasses or products in response to information from monitoring or other sources (e.g., industry members or a state agency), or from observations during antemortem or postmortem inspection indicating that adulterating levels of residue may be present.

In-plant testing procedures may be performed by the inspector, or samples may be submitted to an FSIS laboratory for analysis. Depending upon the weight of evidence that led to the testing, product may be retained until test results indicate the appropriate regulatory disposition. Laboratory testing of surveillance samples is completed as rapidly as possible and takes precedence over monitoring samples.

The annual plan estimates the surveillance samples anticipated on the basis of historical data; however, the actual number required depends entirely upon the needs that arise. A major incident, such as the 1979 PCB contamination problem, could drastically alter the expected surveillance requirement and may require an adjustment of the monitoring plan.

Exploratory projects are conducted for a variety of reasons, but these programs, whatever their objective, have in common the fact that test results normally are not used to take regulatory action or to trigger follow-up surveillance testing. The design of an exploratory project is not suitable for this purpose.

Exploratory projects generally fall within the following two types:

Studies of the occurrence of residues for which no safe limits (i.e., tolerances or action levels) have been established

There are many chemicals (e.g., trace metals, industrial chemicals, and mycotoxins) that may be inadvertently present in animals yet have no established safe levels. Their consistent presence in food, and the resulting need for a tolerance or action level to protect public health, has not been established. FSIS may conduct studies to develop information on the frequency and levels at which such residues occur. These studies may be nationwide or limited to specific geographic areas. Sample collection may be random and statistically based, or biased to obtain "worst case" information. The results are given either to the Food and Drug Administration (FDA) or the Environmental

Protection Agency (EPA), which have responsibility for establishing tolerances for contaminants in food under the Federal Food, Drug and Cosmetic Act. Exploratory programs planned on a limited scale may be expanded if preliminary results raise the level of concern and make acquiring comprehensive information more urgent.

Other projects as appropriate

These may be designed for various purposes, such as evaluating new methods and approaches to monitoring, or supplementing the information used in considering a compound for monitoring.

Domestic Quality Assurance

The Agency enters into memoranda-of-understanding with segments of the meat and poultry industry to provide assurance that when the animals are presented for slaughter they do not contain violative concentrations of chemical residues. This assurance is based both on monitoring records of critical control points in pre-slaughter management control programs and residue testing in USDA-accredited laboratories. Because of this control and testing program at critical control points, these animals may be sampled under a Quality Assurance sampling program rather than the Monitoring Program.

Import Program

Residue testing of import products is an assurance check by USDA that the foreign country's residue control program is effective and that its products meet the same standards applied to products produced in the United States. Monitoring, surveillance, and exploratory programs, as defined above, are carried out. When a violation is found in the monitoring program, subsequent shipments from the same establishment are retained at the port of entry under the surveillance program. All shipments of product from that country are placed on an increased monitoring schedule until a history of compliance for the country is re-established. The rationale for the collection of samples for residue analysis is the same in the domestic and foreign programs. The compounds selected for residue testing in imported products were chosen to parallel the domestic residue program as much as possible. The import plan design is discussed more fully in Section 7, the Annual Plan.

Section 3

CRITERIA FOR COMPOUND EVALUATION AND RANKING

Introduction

Livestock and poultry may be exposed to many compounds during their life cycle.

These compounds include primarily:

- Pesticide chemicals approved for direct application to livestock and poultry or for treating crops that become components of animal feed or that are used in some way in the farm environment
- Animal drugs used to treat or prevent disease or otherwise enhance production
- Environmental contaminants

The Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA) establish the acceptable levels of residues (tolerances) for these compounds in their respective areas of responsibility (pesticides, EPA; animal drugs, environmental contaminants, FDA) and the approved methods of use for specific crops or animals that ensure that tolerances will not be exceeded. Where formal tolerances are not established, FDA and EPA, as appropriate, recommend action levels to FSIS upon request for unavoidable contaminants.

Exposure of animals to environmental contaminants, or the use of pesticides or animal drugs in a way that does not conform with approved uses, can result in unacceptable amounts of residues of these chemicals in the edible tissues of animals at slaughter.

CFR References

Tolerances for these chemicals are listed in the Code of Federal Regulations (CFR) in 40 CFR 180 for pesticides, in 21 CFR 556 for animal drugs, and 21 CFR 109 for unavoidable contaminants. The approved use conditions for animal drugs are given in 21 CFR in parts 520, 522, 524, 526, 529 (new animal drugs not subject to certification), 540, 544, 546, 548 (antibiotic drugs for animal use), and 558 (new animal drugs for use in animal feed).

Need for Criteria

It is not feasible to monitor for residues of all of these chemicals in meat and poultry, nor is this necessary to adequately protect public health. It is, however, important to assess the likelihood that animals exposed to these chemicals may contain residues at levels of concern, and to conduct monitoring, where test methods are available, for those chemicals that are most likely to present the greatest potential risk. A hierarchical compound-assessment scheme is used for this purpose.

Ranking System

Each compound is evaluated on a number of factors, to judge the potential for animal exposure and significance for human health, including:

Factors

- Amount of actual or probable use
- Conditions of use as related to residues at slaughter

CRITERIA FOR COMPOUND EVALUATION AND RANKING

- Potential for misuse to result in harmful residues
- Metabolic patterns of the chemical in animals, plants, and the environment, including the bioavailability and persistence of residues
- Toxicity of the residue

The combined assessment of these factors is used to assign the chemical to one of four categories A, B, C, or D, which represent in descending order the potential for harmful residues to occur in animals at slaughter. ("A-B-C" indicates compounds of greater or lesser importance for the commitment of resources; "D" denotes either "insignificant" or "not yet ranked.") However, a new evaluation system has been developed; see the discussion on 3.A.3-3.A.4.

Selection of Compounds for Monitoring

Compounds are selected for monitoring and included in a plan for the calendar year based on several factors, including:

- Compound ranking assigned
- Whether a practical test method is available and is suitable for regulatory use
- Whether the compound is measurable in a multi-residue method where many compounds, even though all may not be assigned a high ranking, can be tested for at a relatively low cost
- Monitoring or other experience that shows whether adulterating residues are present in meat and poultry

Not all of the hundreds of animal drugs and pesticides listed in the CFR are likely to expose animals to harmful residues. FSIS works from a list of about 400 compounds that includes certain environmental contaminants in addition to animal drugs and pesticides (Section 3.B). At present FSIS has suitable regulatory methods of analysis for 145 of these compounds. Some compounds are routinely included in monitoring because experience shows that without active enforcement adulterating residues will occur. Other compounds may be included in monitoring on a cyclical basis to confirm periodically that a potential residue problem does not exist. Cycling of compounds in monitoring allows the agency to include more compounds in the program than would otherwise be possible within its resources. Compounds rotated out of the program for a specific year are not disregarded; if the need arises, they can be added during that year. Over the last ten years, virtually all the residues for which a suitable method was available have been monitored, except when a compound had an especially low ranking.

In 1986 FSIS planned 46,957 sample analyses for 103 compounds; in 1987 FSIS plans to analyze 59,575 sample units for 108 compounds. Table V in the Annual Plan section of this document shows the resource expenditure required by the 1987 sampling plan.

CRITERIA FOR COMPOUND EVALUATION AND RANKING

A Dynamic System

The process of compound evaluation and ranking is a dynamic one. Additional compounds have to be considered in the system, agricultural use practices change, and additional research on a compound's toxicity and its potential for leaving harmful residues may affect previous rankings. The agency uses an advisory board of scientists from EPA, FDA, and USDA (FSIS and the Agricultural Marketing Service) to identify significant new information that may affect a compound or ranking or indicate an urgent need for monitoring. This advisory relationship is defined in the Memorandum of Understanding among the three agencies published in the Federal Register on January 16, 1985.

Compound Evaluation System (CES)

In the 1985 edition of this document, FSIS/Science announced the implementation of a new prototype Compound Evaluation System (CES). The CES was designed to provide the agency with a more systematic approach to the categorization of compounds with respect to their likelihood of occurrence in meat and poultry and their potential impact on public health. The CES has been subjected to extensive external review by the tri-agency advisory board cited above (Surveillance Advisory Team) and is undergoing final revision.

Briefly, the CES addresses the risk of residues in meat and poultry as a function of two major elements: *hazard* (adverse effects that may be produced by a given compound) and *exposure* (residue level; factors affecting level, such as use patterns, withrdrawal times, etc.; duration of or frequency of consumption of product containing residues of concern). The proposed system is a two-value, hierarchical compound ranking scheme that classifies a given pesticide, animal drug, or contaminant in any one of 16 categories. Compounds of greatest concern carry a designation of A-1 (high health hazard potential; high likelihood of residue occurrence); those compounds of least concern are designated D-4 (negligible health hazard potential; negligible likelihood of residue occurrence). The letter Z is used to indicate an element of the two-value system lacking the information needed for classification. Care is taken to avoid the use of exact numerical rankings that might suggest a high degree of sophistication possibly not justifiable because of data limitations or the assumptions inherent in the ranking process.

The assignment of a specific ranking is based on a review of information entered in a comprehensive set of CES worksheets prepared for each compound evaluated. These worksheets provide a permanent record and chronology of the nature and extent of the technical and scientific data that were considered. Certain compounds considered within the FSIS National Residue Program have been evaluated using the new CES. These compounds and their rankings are presented in a note at the end of Section 3.B. It should be understood that the rankings are based strictly on data available to FSIS at the time and may well change as additional information becomes available in the open literature, from other agencies, or from

the private sector. To further advance the CES effort, FSIS is using outside assistance in the preparation of a series of compound evaluation reports that will provide the basic information necessary to prepare the CES worksheets. To this end, a contract was awarded that calls for the preparation of evaluative reports on 50 compounds of potential concern to the agency. This work is now underway.

FSIS believes that the Compound Evaluation System is sufficiently flexible to permit rapid response to new information that may affect previous rankings and to allow for the use of scientific or expert judgement. However, it must be emphasized that the CES was neither designed nor intended for use in the development of formal quantitative estimates of risk from meatborne residues. Rather it provides a rational basis for changes in compound emphasis within the National Residue Program and encourages development of new analytical methods for important compounds for which no methods exist. As such, the CES serves as a useful guide in the planning and allocation of FSIS Program resources for those residues considered to represent the greatest potential effect on public health. The CES is updated as appropriate to provide the FSIS with a constant, informative, and sound approach to dealing with residues in meat and poultry.

The compounds in the List of Compounds Considered that have been assigned values in the new system are marked with an asterisk. The compounds and their rankings are listed in a note at the end of Section 3.B.

FSIS welcomes comments or suggestions regarding the CES; a copy of the CES document is available upon request. Please send comments or requests regarding the CES to:

USDA, FSIS, Science Program
Director, Residue Evaluation and Planning Division
300 12th St., S.W.
Washington, D.C. 20250

LIST OF COMPOUNDS CONSIDERED

System of Compound Listing and Counting

In an eclectic document such as this, a set of rules must be applied for uniformity in listing different forms of the chemical (i.e., salts, esters, isomers, etc.) and significant metabolites. We applied the following criteria for uniformity in our listings.

- CFR reference names, where available, are used for the primary entries; exceptions are footnoted. (Note: In the original edition of this document, some common and trade names were used in the tolerance section. This inconsistency was sometimes confusing; CFR names are now used in both the List of Compounds Considered and the tolerance section. All names thus affected have been included in the cross-reference section.)

- Isomers of a compound—compounds having the same percentage composition and molecular weight but differing in chemical or physical properties—are not listed separately.

- Different salts, esters, etc. are listed separately where the use conditions of these substances appear in different CFR citations. For example, penicillin and penicillin G are listed as two compounds. The various forms of penicillin G—free acid, benzathine, sodium salt, and procaine salts—are shown in the listing under penicillin G but are not counted individually.

- Metabolites are listed separately only when the tolerance citation refers to a specific metabolite, or where a suitable regulatory method is available for the metabolite.

- Complex mixtures such as PCB's are listed as a single entry.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Acephate	40 CFR 180.108	yes	D
Acepromazine	21 CFR 520.23 21 CFR 522.23	no	D
2-Acetylamino-5-nitrothiazole	21 CFR 556.20	yes	D
Aflatoxin	none	no	A-4*
Aklomide	21 CFR 556.30 21 CFR 558.35	yes	C
Alachlor	40 CFR 180.249	no	A-2*
Albendazole	none	no	A-2*
Aldicarb	40 CFR 180.269	yes	A-4*
Aldrin	40 CFR 180.135	yes	A-3*
(Alpha RS, 2R)-fluvalinate [(RS)-alpha-cyano-3-phenoxybenzyl (R)-2-[2-chloro-4-(trifluoromethyl)anilino-3-methyl-butanoate	40 CFR 180.427	no	D
Ametryn	40 CFR 180.258	no	A
4-Amino-2-chloro-benzamide (metabolite of aklomide)	21 CFR 556.30 21 CFR 558.35	no	C
4-Amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one	40 CFR 180.332	yes[1]	D
2-Amino-N-isopropyl benzamide (metabolite of bentazon)	40 CFR 180.355	no	D
Aminomethyl phosphonic acid (metabolite of glyphosate)	40 CFR 180.364	no	D
2-Amino-6-methyl-pyrimidin-4-ol (metabolite of pirimiphos-methyl)	40 CFR 180.409	no	D
3-Amino-5-nitro-o-toluamide (metabolite of zoalene)	21 CFR 556.770	no	B

[1]As Sencor.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Amitraz	21 CFR 561.195 40 CFR 180.287	no	D
Amoxicillin trihydrate	21 CFR 556.38 21 CFR 540.103	no	B
Ampicillin	21 CFR 556.40 21 CFR 540.105	yes	B-2*
Ampicillin trihydrate	21 CFR 556.40 21 CFR 540.107	yes	B-2*
Amprolium	21 CFR 556.50 21 CFR 520.100 21 CFR 558.55	yes	A
Apramycin	21 CFR 556.52 21 CFR 520.110	no	D
Arsanilate sodium	21 CFR 556.60 21 CFR 558.60	no	A
Arsanilic acid	21 CFR 556.60 21 CFR 558.62	no	C-1*
Arsenate, Calcium	40 CFR 180.192	no	C
Arsenate, Copper	40 CFR 180.193	no	D
Arsenate, Lead	40 CFR 180.194	no	D
Arsenate, Magnesium	40 CFR 180.195	no	D
Arsenate, Sodium	40 CFR 180.196	no	D
Arsenic	21 CFR 556.60	yes	A
Arsenite, Potassium	40 CFR 180.334	no	D
Arsenite, Sodium	40 CFR 180.335	no	D
Atrazine	40 CFR 180.220	yes	C-3*
Azaperone	21 CFR 522.150	no	B-4*

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Bacitracin methylene disalicylate	21 CFR 556.70 21 CFR 548.112 21 CFR 558.76	yes	C
Bacitracin zinc	21 CFR 556.70 21 CFR 548.114 21 CFR 558.78	yes	C
Bambermycins[1]	21 CFR 558.95	no	D
Bendiocarb	none	yes[2]	D
Benomyl	40 CFR 180.294	yes	B-3*
Bentazon	40 CFR 180.355	no	D
BHC	40 CFR 180.140	yes[3]	B-2*
3,6-Bis (2-chlorophenyl)-1,2,4,5-tetrazine	none	no	D
Bismuth subsalicylate	NADA 010-158	no	D
Bromoxynil	40 CFR 180.324	no	D
Buquinolate	21 CFR 556.90 21 CFR 558.105	yes	D
sec-Butyl amine	21 CFR 561.60 40 CFR 180.321	yes	D
3-tert-Butyl-5-chloro-6-hydroxymethyluracil (metabolite of terbacil)	40 CFR 180.209	no	D
4-tert-Butyl-2-chlorophenol (metabolite of 4-tert-Butyl-2-chlorophenyl methyl methylphosphoramidate)	40 CFR 180.295	no	D
4-tert-Butyl-2-chlorophenyl methyl methylphosphoramidate	40 CFR 180.295 21 CFR 520.512[4]	yes[4]	B

[1]Common name, flavomycin.
[2]As Ficam.
[3]As benzene hexachloride.
[4]As crufomate.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
2-tert-Butyl-4-(2,4-dichloro-5-hydroxy-phenyl) $\Delta^2$1,3,4-oxadiazolin-5-one (metabolite of oxadiazon)	40 CFR 180.346	no	D
Butyl 2[4-[[5-(trifluoromethyl)-2-pyridinyl]oxy]phenoxy] propionate (butyl ester of fluazifop)	40 CFR 180.411	no	D
Cacodylic acid	40 CFR 180.311	no	D
Cadmium	none	no	B-4*
Calcium	none	no	D
Cambendazole	21 CFR 520.300	no	B
Captan	40 CFR 180.103	yes	B-3*
Carbadox	21 CFR 556.100 21 CFR 558.115	yes	A-3*
Carbarsone	21 CFR 556.60 21 CFR 558.120	no	C-2*
Carbaryl	40 CFR 180.169	yes	D
Carbofuran	40 CFR 180.254	yes	C-3*
Carbomycin	21 CFR 556.110 21 CFR 520.1660a	yes	D
Carbophenothion	40 CFR 180.156	yes	D
Carboxin	40 CFR 180.301	no	C-4*
3-Carboxy-5-ethoxy-1,2,4-thiadiazole (metabolite of 5-ethoxy-3-(trichloromethyl 1,2,4-thiadiazole)	40 CFR 180.370	no	D
2-Carboxyisopropyl-4-(4-dichloro)-5-isopropoxyphenyl) $\Delta^2$1,3,4-oxadiazolin-5-one (metabolite of oxadiazon)	40 CFR 180.346	no	D
Cephapirin benzathine	21 CFR 556.115 21 CFR 526.363	yes	D

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Cephapirin sodium	21 CFR 556.115 21 CFR 529.365	yes	D
Chloral hydrate	21 CFR 522.380	no	D
Chloramphenicol	21 CFR 555	no	A-2*
Chloramphenicol palmitate	21 CFR 555.111	no	A-2*
Chlorbromuron	40 CFR 180.279	no	D
Chlordane (technical)[1]	40 CFR 180.122	yes	A-2*
Chlordecone	none	no	D
Chlordimeform	40 CFR 180.285	yes	D
Chlorhexidine dihydrochloride	21 CFR 556.120 21 CFR 524.402 21 CFR 529.400	yes	C
Chlormadinone acetate	none[2]	yes	D
4-Chloro-5-amino-2-(a,a,a-trifluoro--m-tolyl)-3(2H)-pyridazinone (metabolite of norflurazon)	40 CFR 180.356	no	D
Chlorobutanol	21 CFR 556.140	no	D
2-Chloro-N,N-diallylacetamide	40 CFR 180.282	yes	C
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate	40 CFR 180.322	no	D
6-Chloro-2,3-dihydro-7-hydroxymethyl-3,3-dimethyl-5H-oxazolo(3,2-a)pyrimidin-5-one (metabolite of terbacil)	40 CFR 180.209	no	D
6-Chloro-2,3-dihydro-3,3,7-trimethyl-5H-oxazolo(3,2-a)pyrimidin-5-one (metabolite of terbacil)	40 CFR 180.209	no	D
2-Chloro-N-isopropylacetanilide	40 CFR 180.211	yes[3]	D

[1]Residues of metabolized technical chlordane are reported as the sum of the isomers of chlordane, oxychlordane, and nonachlor.
[2]Tolerances withdrawn in June, 1982.
[3]As propachlor.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Chloroneb	40 CFR 180.257	no	D
1-(4-Chlorophenoxy)-3,3-dimethyl--1-(1H-1,2,4-triazol-1-yl)-2-butanone	40 CFR 180.410	no	D
beta-(4-Chlorophenoxy)-alpha-(1,1-dimethylethyl)-1H-1,2,4-triazole-1-ethanol (metabolite of 1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-1-yl)-2-butanone)	40 CFR 180.410	no	D
2-(m-Chlorophenoxy)propionic acid	40 CFR 180.325	no	D
S-(2-Chloro-1-phthalimidoethyl) O,O-diethyl phosphorothioate (oxygen analog of dialifor)	40 CFR 180.326	no	D
6-Chloropicolinic acid (metabolite of nitrapyrin)	40 CFR 180.350	no	C
Chlorothiazide	21 CFR 520.420	no	D
2-Chloro-1-(2,4,5-trichlorophenyl)-vinyl dimethyl phosphate	40 CFR 180.252	yes[1]	A
5-[2-Chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoic acid (metabolite of sodium salt of acifluorfen)	40 CFR 180.383	no	D
Chlorpyrifos	40 CFR 180.342	yes	B-4*
Chlorpyrifos-methyl and metabolite	40 CFR 180.419	no	D
Chlorsulfuron	40 CFR 180.405	no	D
Chlortetracycline bisulfate	21 CFR 556.150 21 CFR 558.128 21 CFR 546.113	yes	A
Chlortetracycline hydrochloride	21 CFR 556.150 21 CFR 558.128 21 CFR 546.110	yes	A
Chorionic gonadotrophin	21 CFR 522.1081	no	D

[1]As Gardona.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Clopidol	21 CFR 556.160 21 CFR 558.175	yes	C
Clorsulon	21 CFR 556.163 21 CFR 520.462	no	D
Cloxacillin, Benzathine	21 CFR 556.165 21 CFR 540.814	yes	B
Cloxacillin, Sodium	21 CFR 556.165 21 CFR 540.815	yes	B
Cobalt	none	no	D
Copper	none	no	D
Copper glycinate	NADA 031-971	no	D
Copper naphthenate	NADA 012-991	no	D
Corticotropin	NADA 008-760	no	D
Coumaphos and oxygen analog	40 CFR 180.189 21 CFR 558.185	yes	A
Cresylic acid	none	no	D
Cyano(3-phenoxyphenyl)methyl-4-chloro-a-(methylethyl)benzene-acetate	40 CFR 180.379	no	D
Cypermethrin	40 CFR 180.418	no	D
Cyromazine[1] and metabolite	40 CFR 180.414	no	D
2,4,D (technical)	40 CFR 180.142	yes	B-2*
Dalapon	40 CFR 180.150	yes	A-3*
Daminozide	40 CFR 180.246	yes	B-3*
DDE (metabolite of DDT)	40 CFR 180.147	no	A
DDT	40 CFR 180.147	yes	A

[1]Trade name Larvadex.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Decoquinate	21 CFR 556.170 21 CFR 558.195	yes	Z-4*
Demeton	40 CFR 180.105	yes	D
Dexamethasone	21 CFR 520.540	no	C
Dialifor and oxygen analog	40 CFR 180.326	yes	D
1,1-Dichloro-2,2-bis(p-ethylphenyl) ethane	40 CFR 180.139	yes[1]	D
Dibromochloropropane	none	no	D
Dibutyltin dilaurate	NADA 008-741	no	D
Dicamba	40 CFR 180.227	no	C
3,5-Dichloro-N-(1,1-dimethyl-2-propynyl)benzamide	40 CFR 180.317	no	C
3-(2,2-Dichloroethenyl)-2,2-dimethylcyclopropane carboxylic acid (metabolite of permethrin)	40 CFR 180.378	no	D
3,6-Dichloro-5-hydroxy-o-anisic acid (metabolite of dicamba)	40 CFR 180.227	no	C
2,5-Dichloro-4-methoxyphenol (metabolite of chloroneb)	40 CFR 180.257	no	D
2,4-Dichlorophenol (metabolite of 2,4-D)[2]	40 CFR 180.142	no	B
2,4-Dichlorophenoxyacetic acid [metabolite of 4-(2,4-dichlorophenoxy) butyric acid	40 CFR 180.331	no	D
4-(2,4-Dichlorophenoxy butyric acid	40 CFR 180.331	no	D
1-(2,4-Dichlorophenyl)-2-(1H-imidizole-1-yl)-1-ethanol (metabolite of imazalil)	40 CFR 180.413	no	D

[1]As Perthane.
[2]Common name 2,4-DCP.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
3-(1-(2,4-Dichlorophenyl)-2-(1H-imidizole-1-yl)-ethoxyl)-1,2-propanediol (metabolite of imazalil)	40 CFR 180.413	no	D
2,4-Dichlorophenyl p-nitrophenyl ether[1]	none	no	D
2,2-Dichlorovinyl dimethyl phosphate (metabolite of naled)	40 CFR 180.215	no	B
Dichlorvos	21 CFR 556.180 21 CFR 520.600 21 CFR 558.205 40 CFR 180.235[2]	yes	B-4*
Dieldrin	40 CFR 180.137 40 CFR 180.145	yes	A
S-[[(Diethoxyphosphinothioyl)thio]-methyl] O,O-diethyl phosphorothioate (oxygen analog of ethion)	40 CFR 180.173	no	B
2-Diethylamino-6-methyl-pyrimidin-4-ol (metabolite of pirimiphos-methyl)	40 CFR 180.409	no	D
O,O-Diethyl O-3-chloro-4-methyl-2-oxo (2H)-1-benzopyran-7-yl phosphate (oxygen analog of coumaphos)	40 CFR 180.189	no	A
O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	40 CFR 180.183	yes[3]	D
O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	40 CFR 180.153	yes[4]	D
O,O-Diethyl-O-[p-(methylsulfinyl) phenyl]phosphorothioate	40 CFR 180.234	no	B
Diethylstilbestrol	none	yes	D
Difenzoquat	40 CFR 180.369	no	D
Diflubenzuron	40 CFR 180.377	no	D

[1]Common name nitrofen.
[2]As 2,2-dichlorovinyl dimethyl phosphate.
[3]As Disyston, common name disulfoton.
[4]As Diazinon.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
5,6-Dihydro-3-carboxanilide-2-methyl-1,4-oxathiin-4-oxide (metabolite of carboxin)	40 CFR 180.301	no	D
5,6-Dihydrodihydroxycarbaryl (metabolite of carbaryl)	40 CFR 180.169	no	D
5,6-Dihydrodihydroxynaphthol (metabolite of carbaryl)	40 CFR 180.169	no	D
2,3-Dihydro-5,6-dimethyl-1,4-dithiin-1,1,4,4-tetraoxide	40 CFR 180.406	no	D
2,3-Dihydro-2,2-dimethyl-3,7-benzofurandiol (metabolite of carbofuran)	40 CFR 180.254	no	C
2,3-Dihydro-2,2-dimethyl-7-benzofuranol (metabolite of carbofuran)	40 CFR 180.254	no	C
2,3-Dihydro-2,2-dimethyl-3-hydroxy-7-benzofuranyl-N-methylcarbamate (metabolite of carbofuran)	40 CFR 180.254	no	C
2,3-Dihydro-2,2-dimethyl-3-oxo-7-benzofuranol (metabolite of carbofuran)	40 CFR 180.254	no	C
2,3-Dihydro-3,3-dimethyl-2-oxo-5-benzofuranyl methanesulfonate (metabolite of ethofumesate)	40 CFR 180.345	no	D
Dihydrostreptomycin	21 CFR 556.200 21 CFR 544.173 21 CFR 544.275	yes	D
Dimethoate and oxygen analog	40 CFR 180.204	yes	B-3*
(O,O-Dimethyl O-p-(dimethylsulfamoyl) phenyl phosphate) (oxygen analog of O,O-dimethyl O-p-(dimethylsulfamoyl) phenyl phosphorothioate)	40 CFR 180.233	no	B

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
O,O-Dimethyl O-p-(dimethylsulfamoyl) phenyl phosphorothioate	21 CFR 524.900[1] 21 CFR 558.254[1] 40 CFR 180.233	no	B
O,O-Dimethyl S-(N-methylcarbamoyl-methyl) phosphorothioate (oxygen analog of dimethoate)	40 CFR 180.204	no	D
O,O-Dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl] phosphorodithioate	40 CFR 180.154	yes[2]	D
Dimethyl-4,4[1]-o-phenylene bis (allophanate) (oxygen analog of thiophanate-methyl)	40 CFR 180.371	no	D
N,N-Dimethylpiperidinium chloride	40 CFR 180.384	no	D
Dimethyl phosphate of a-methyl-benzyl 3-hydroxy-cis-crotonate	40 CFR 180.280	no	D
O,S-Dimethyl phosphoramidothioate (metabolite of acephate)	40 CFR 180.108	no	D
Dimetridazole	21 CFR 556.210 21 CFR 558.240	yes	C
3,5-Dinitrobenzamide	21 CFR 556.220 21 CFR 558.376[3]	yes	D
Dinoseb	40 CFR 180.281	no	C
Dioxathion	40 CFR 180.171	yes	D
Diphenylamine	40 CFR 180.190	yes	B-4*
Dipropyl isocinchomeronate	40 CFR 180.143 40 CFR 180.319	no	A
Diquat	40 CFR 180.226	no	D
Diuron	40 CFR 180.106	yes	A

[1]As famphur.
[2]As azinophosmethyl and as Guthion.
[3]As nitromide.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta[cd]pentalene	40 CFR 180.251	yes[1]	A
Dodine	40 CFR 180.172	yes	D
Endosulfan	40 CFR 180.182	yes	D
Endosulfan sulfate (metabolite of endosulfan)	40 CFR 180.182	no	D
Endrin	40 CFR 180.131	yes	A-3*
Erythromycin	21 CFR 556.230 21 CFR 526.820	yes	A
Erythromycin phosphate	21 CFR 556.230 21 CFR 520.823	yes	A
Erythromycin thiocyanate	21 CFR 556.230 21 CFR 558.248	yes	A
Estradiol	21 CFR 522.840	yes	A
Estradiol benzoate	21 CFR 556.240 21 CFR 522.842	yes	A
Estradiol monopalmitate	21 CFR 556.250 21 CFR 522.844	yes	A
Estradiol valerate	21 CFR 522.850	yes	A
Ethion and oxygen analog	40 CFR 180.173	yes	B
Ethofumesate	40 CFR 180.345	no	D
Ethopabate	21 CFR 556.260 21 CFR 558.58	yes	B
2-(1-(Ethoxyimino)butyl)-5-(2-(ethylthio)propyl)-3-hydroxy-2-cyclohexene-1-one	40 CFR 180.412	no	D
5-Ethoxy-3-(trichloromethyl)-1,2,4-thiadiazole	40 CFR 180.370	no	D

[1]As mirex.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
2-Ethylamino-6-methyl-pyrimidin-4-ol (metabolite of pirimiphos-methyl)	40 CFR 180.409	no	D
O-(2-Ethylamino-6-methyl-pyrimidin-4-yl) O,O-dimethyl phosphorothioate (metabolite of pirimiphos-methyl)	40 CFR 180.409	no	D
Ethyl 4,4'-dichlorobenzilate (chlorobenzilate)	40 CFR 180.109	yes[1]	D
Ethylene dibromide	40 CFR 180.126[2] 40 CFR 180.397	no	A-4*
Ethyl 3-methyl-4-(methylsulfinyl) phenyl (1-methylethyl) phosphoramidate (metabolite of ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl) phosphoramidate)	40 CFR 180.349	no	D
Ethyl 3-methyl-4-(methylsulfonyl) phenyl (1-methylethyl) phosphoramidate (metabolite of ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl) phosphoramidate)	40 CFR 180.349	no	D
Ethyl 3-methyl-4-(methylthio) phenyl phosphoramidate (metabolite of ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl) phosphoramidate)	40 CFR 180.349	no	D
Ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate	40 CFR 180.349	no	D
2-[(2-Ethyl-6-methylphenyl) amino]-1-propanol(metabolite of metolachlor)	40 CFR 180.368	no	D
4-(2-Ethyl-6-methylphenyl)-2-hydroxy-5-methyl-3-morpholinone (metabolite of metolachlor)	40 CFR 180.368	no	D

[1]As chlorobenzilate.
[2]No tolerances have been established for residues in meat and poultry.
*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Ethyl 4-(methylsulfinyl)phenyl phosphoramidate (metabolite of ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate)	40 CFR 180.349	no	D
Ethyl 4-(methylsulfonyl)phenyl phosphoramidate (metabolite of ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate)	40 CFR 180.349	no	D
O-Ethyl-O-[4-(methylthio) phenyl] S-propyl phosphorodithioate	40 CFR 180.374	no	D
O-Ethyl S-phenyl ethylphosphonodithioate[1]	40 CFR 180.221	no	D
S-[2-(Ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate	40 CFR 180.330	no	D
Fenbendazole	21 CFR 556.275 21 CFR 520.905 21 CFR 558.258	no	B-3*
Fenitrothion	none	no	D
Fenprostalene	21 CFR 556.277 21 CFR 522.914	no	D
Fenthion	40 CFR 180.214 21 CFR 524.920	yes	C-3*
Florogestrone acetate	NADA 034-601	no	D
Fluazifop and butyl ester	40 CFR 180.411	no	D
Flucythrinate	40 CFR 180.400	no	D
Flumethasone	21 CFR 520.960 21 CFR 522.960 21 CFR 524.960	no	D
Fluprednisolone	NADA 012-555	no	D

[1]Common name fonofos.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Fluprednisolone acetate	NADA 011-789	no	D
Fluridone	40 CFR 180.420	no	D
Folic acid	NADA 013-029	no	D
Follicle stimulating hormone	NADA 009-505	no	D
Furaltadone	21 CFR 556.280 21 CFR 526.1014	no	B
Furazolidone	21 CFR 556.290 21 CFR 524.1005 21 CFR 558.262	yes	A-1*
Furosemide	21 CFR 522.1010	no	D
Gentamicin sulfate	21 CFR 556.300 21 CFR 520.1044 21 CFR 522.1044 21 CFR 524.1044 21 CFR 529.1044	yes	B-2*
Gentian violet	none	yes	D
Glyphosate	40 CFR 180.364	no	D
Halofuginone	21 CFR 556.308 21 CFR 558.265	no	D
Halcxon	21 CFR 556.310 21 CFR 520.1120	yes	C
HCB	none	no	D
Heptachlor and heptachlor epoxide (oxidation product of heptachlor)	40 CFR 180.104	yes	A-1*
Hetacillin, Potassium	21 CFR 540.829	no	B
Hexakis(2-methyl-2-phenylpropyl) distannoxane	40 CFR 180.362	yes[1]	C

[1]As "hexakis."

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Hexazinone	40 CFR 180.396	no	D-4*
Hexetidine	NADA 013-772	no	D
Hydrochlorothiazide	21 CFR 522.1150	no	D
Hydrocortisone acetate	21 CFR 556.320 21 CFR 524.1484d,h,i	no	C
2-Hydroxy-2,3-dihydro-3,3-dimethyl-5-benzofuranyl methanesulfonate (metabolite of ethofumesate)	40 CFR 180.345	no	D
N-(2-Hydroxymethyl-6-methyl)-N-(methoxyacetyl)-alanine methylester (metabolite of metalaxyl)	40 CFR 180.408	no	D
5-Hydroxythiabendazole (metabolite of thiabendazole)	21 CFR 556.730 40 CFR 180.242 21 CFR 558.615	no	A
Hygromycin B	21 CFR 556.330 21 CFR 558.274	yes	C
Imazalil	40 CFR 180.413	no	D
Iprodione	40 CFR 180.399	no	D
Ipronidazole	21 CFR 556.340 21 CFR 558.305	yes	Z-4*
Ipronidazole hydrochloride	21 CFR 556.340 21 CFR 520.1162	no	Z-4*
Iron	none	no	D
Isopropyl carbanilate (IPC)	40 CFR 180.319	no	D
Isopropyl m-chlorocarbanilate (CIPC)	40 CFR 180.319	no	D
Ivermectin	21 CFR 556.344 21 CFR 520.1192 21 CFR 522.1192	no	B-1*

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Lasalocid	21 CFR 556.347 21 CFR 558.311	no	B
Lead	none	no	B-4*
Levamisole hydrochloride	21 CFR 556.350 21 CFR 558.315 21 CFR 520.1242	yes	C-2*
Levamisole phosphate	21 CFR 556.350 21 CFR 522.1244	no	C-2*
Lidocaine hydrochloride	21 CFR 522.1258	no	D
Lincomycin hydrochloride	21 CFR 556.360 21 CFR 520.1263 21 CFR 522.1260 21 CFR 558.325	yes	B
Lindane[1]	40 CFR 180.133	yes	A-2*
Linuron	40 CFR 180.184	yes	C
Lysergic acid diethylamide	none	no	D
Malathion	40 CFR 180.111	yes	B
Maneb	40 CFR 180.110	yes	D
Manganese	21 CFR 582.5446	no	D
Mebendazole	21 CFR 520.1320	no	B-4*
Mefluidide	40 CFR 180.386	no	D
Melamine (metabolite of cyromazine)	40 CFR 180.414	no	D
Melengestrol acetate	21 CFR 556.380 21 CFR 558.342	yes	A
N-(Mercaptomethyl)phthalimide S-(O,O-dimethyl phosphorodithioate)	40 CFR 180.261 21 CFR 524.1742	no	D
N-(Mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorothioate) (oxygen analog of N-(mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorodithioate))	40 CFR 180.261 21 CFR 524.1742	no	D

[1]The gamma isomer of BHC.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Mercury	none	no	D
Metalaxyl	40 CFR 180.408	no	D
Methamidophos[1]	40 CFR 180.315	no	D
Methanearsonic acid	40 CFR 180.289	yes	D
Methoprene	40 CFR 180.359	yes	D
Methoxychlor	40 CFR 180.120	yes	D-4*
Methyl bromide	none	no	B-4*
2-Methyl-4-chlorophenol (metabolite of 2-methyl-4-chlorophenoxyacetic acid)	40 CFR 180.339	no	B
2-Methyl-4-chlorophenoxyacetic acid	40 CFR 180.339	no	B
Methyl-[2-chloro-4-(trifluoromethyl)-phenoxy]-2-nitrobenzoate (metabolite of sodium salt of acifluorfen)	40 CFR 180.383	no	D
6-Methyl-1,3-dithiolo [4,5-b] quinoxalin-2-one	40 CFR 180.338	no	D
Methylene chloride	40 CFR 180.1010	no	A-2*
1-Methylethyl 2-((ethoxy(1-amino) phosphinoyl)oxy)benzoate (metabolite of 1-methylethyl 2-((ethoxy((1-methylethyl)amino) phosphinothioyl)oxy)benzoate)	40 CFR 180.387	no	D
1-Methylethyl 2-((ethoxy(1-amino) phosphinothioyl)oxy)benzoate (metabolite of 1-methylethyl 2-((ethoxy((1-methylethyl)amino) phosphinothioyl)oxy)benzoate)	40 CFR 180.387	no	D
1-Methylethyl 2-((ethoxy((1-methylethyl)amino)phosphinothioyl) oxy)benzoate	40 CFR 180.387	no	D

[1]Also listed as O,S-dimethyl phosphoramidothioate, a metabolite of acephate, q.v.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
1-Methylethyl 2-((ethoxy((1-methylethyl)amino)phosphinoyl) oxy)benzoate (metabolite of 1-methylethyl 2-((ethoxy((1-methylethyl)amino) phosphinothioyl)oxy)benzoate	40 CFR 180.387	no	D
2-Methyl 2-(methylsulfinyl) propionaldehyde O-(methylcarbamoyl) oxime (metabolite of aldicarb)	40 CFR 180.269	no	D
2-Methyl-2-(methylsulfonyl) propionaldehyde O-(methylcarbamoyl) oxime (metabolite of aldicarb)	40 CFR 180.269	no	D
1-Methyl-5-nitroimidazole-2-isopropanol (metabolite of ipronidazole)	21 CFR 556.340 21 CFR 558.305	no	B
Methyl parathion	40 CFR 180.121	yes	D
Metolachlor	40 CFR 180.368	no	D
Metoserpate hydrochloride	21 CFR 556.410 21 CFR 520.1422	yes	D
Metsulfuron methyl	40 CFR 180.428	no	D
Monensin	21 CFR 556.420 21 CFR 520.1448 21 CFR 558.355	yes	B-3*
Monuron	none	no	D
Monuron-TCA	none	no	D
Morantel tartrate	21 CFR 556.425 21 CFR 520.1450 21 CFR 558.360	no	D
Naled	40 CFR 180.215	yes	B-4*
Naloxone hydrochloride	21 CFR 522.1462	no	D

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
1-Naphthol (metabolite of carbaryl)	40 CFR 180.169	no	D
Narasin	21 CFR 556.428 21 CFR 558.363	no	D
Neomycin sulfate	21 CFR 556.430 21 CFR 522.1484 21 CFR 524.1484	yes	B-3*
Neostigmine methyl sulfate	21 CFR 522.1503	no	C
Nequinate	21 CFR 556.440 21 CFR 558.365	yes	D
Nicarbazin	21 CFR 556.445 21 CFR 558.366	no	C
Nickel	none	no	D
Nicotine	40 CFR 180.167a 40 CFR 180.319	no	D
Nifuraldezone	none	no	C
Nitrapyrin	40 CFR 180.350	no	C
Nitrofurazone	21 CFR 524.1580 21 CFR 558.370	no	B-1*
Nonachlor[1]	none	no	D
Norflurazon	40 CFR 180.356	no	D
Novobiocin	21 CFR 556.460 21 CFR 558.415	yes	B
Nystatin	21 CFR 556.470 21 CFR 558.430	yes	B
N-Octyl bicycloheptenedicarboximide	40 CFR 180.367	no	C
Oleandomycin	21 CFR 556.480 21 CFR 558.435	yes	A
Ormetoprim	21 CFR 556.490 21 CFR 558.575	yes	D

[1]Reported as nonachlor only when it is not included with residues of metabolized chlordane.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Oxadiazon	40 CFR 180.346	no	D
Oxfendazole	21 CFR 520.1628,29,30	no	D
Oxyfluorfen	40 CFR 180.381	no	D
Oxytetracycline hydrochloride	21 CFR 556.500 21 CFR 558.450 21 CFR 520.1662 21 CFR 522.1660	yes	A
Oxytocin	21 CFR 522.1680	no	D
Paraquat	40 CFR 180.205	yes	A-4*
Parathion	40 CFR 180.121	yes	D
PBB (Polybrominated biphenyls)	none	no	D
PCB's (Polychlorinated biphenyls)	21 CFR 109.30	no	A-4*
Pentachlorophenol (PCP)	none	yes	B-1*
Penicillin, procaine and procaine G	21 CFR 556.510 21 CFR 558.460	yes	A
Penicillin G (benzathine, free acid, sodium salt, and procaine salts)	21 CFR 556.510 21 CFR 540.874	yes	A
Permethrin	40 CFR 180.378	no	B-2*
Phencyclidine	none	no	D
Phenothiazine	40 CFR 180.319	no	C
3-Phenoxybenzoic acid (metabolite of permethrin)	40 CFR 180.378	no	D
(3-Phenoxyphenyl) methanol (metabolite of permethrin)	40 CFR 180.378	no	D
Phorate	40 CFR 180.206	yes	D
Phosolone	40 CFR 180.263	yes	D

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Picloram	40 CFR 180.292	no	B
Piperazine	21 CFR 520.1802	no	D
Piperonyl butoxide	40 CFR 180.127	yes	A
Pirimiphos-methyl	40 CFR 180.409	no	D
Pituitary luteinizing hormone	21 CFR 522.1820	no	D
Poloxalene	21 CFR 558.464 21 CFR 558.465	no	D
Polymixin	21 CFR 544.373b	no	C
Potassium salt of 1-(4-chlorophenyl) -1,4-dihydro-6-methyl-4-oxo-pyridazine-3-carboxylic acid	40 CFR 180.423	no	D
Prednisolone	21 CFR 556.520 21 CFR 522.1880-1890	no	D
Prednisone	21 CFR 556.530	no	D
Profenofos	40 CFR 180.404	no	D
Profluralin	40 CFR 180.348	no	D
Progesterone	21 CFR 556.540 21 CFR 522.1940	yes	B
Prometryn	40 CFR 180.222	no	C-3*
Propanil	40 CFR 180.274	yes[1]	D
Proparacaine hydrochloride	21 CFR 524.1982	no	D
Propargite	40 CFR 180.259	yes	B
Propazine	40 CFR 180.243	no	A
Propiopromazine	21 CFR 520.2002 21 CFR 522.2002	no	D

[1]As Stam.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Prostaglandin	none	no	C
Pyrantel tartrate	21 CFR 556.560 21 CFR 520.2045 21 CFR 558.485	yes	B
Pyrethrins	40 CFR 180.128	yes	D
Quinoxaline-2-carboxylic acid (metabolite of carbodox)	21 CFR 556.100 21 CFR 558.115	no	B
Reserpine	none	yes	D
Robenidine hydrochloride	21 CFR 556.580 21 CFR 558.515	yes	C
Ronnel	40 CFR 180.177 21 CFR 558.526 21 CFR 520.2080	yes	B
Roxarsone	21 CFR 556.60 21 CFR 558.530	no	C-1*
Salicylic acid	21 CFR 556.590 21 CFR 529.2090	no	D
Selenium	21 CFR 522.2100 21 CFR 573.920	no	D
Silvex	40 CFR 180.340	yes	A-3*
Simazine	40 CFR 180.213	yes	A
Sodium 5-[2-Chloro-4-(trifluoromethyl)-phenoxy]-2-aminobenzoate (metabolite of sodium salt of acifluorfen)	40 CFR 180.383	no	D
Sodium salt of acifluorfen	40 CFR 180.383	no	D
Sodium sulfachloropyrazine monohydrate	21 CFR 556.625	yes	D
Spectinomycin dihydrochloride	21 CFR 556.600 21 CFR 520.2122 21 CFR 522.2120	yes	C

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
Streptomycin	21 CFR 556.610 21 CFR 544.110-973b 40 CFR 180.245	yes	A-3*
Styrene	none	no	D
Sulfabromomethazine sodium	21 CFR 556.620 21 CFR 520.2170	no	C
Sulfachloropyridazine	21 CFR 556.630 21 CFR 520.2200 21 CFR 522.2200	yes	A
Sulfadimethoxine	21 CFR 556.640 21 CFR 520.2220 21 CFR 522.2220 21 CFR 558.575	yes	A
Sulfaethoxypyridazine	21 CFR 556.650 21 CFR 520.2240 21 CFR 522.2240 21 CFR 558.579	yes	A
Sulfamethazine	21 CFR 556.670 21 CFR 520.2260 21 CFR 522.2260	yes	B-1*
Sulfamethoxypyridazine	21 CFR 520.2300	no	D
Sulfanitran	21 CFR 556.680 21 CFR 520.2320	yes	A
Sulfapyridine	none	no	D
Sulfaquinoxaline	21 CFR 520.2325 21 CFR 558.586	no	B-1*
Sulfathiazole	21 CFR 556.690	yes	B-1*
Sulfisoxazole	21 CFR 520.2330	no	C
Sulfomyxin	21 CFR 556.700 21 CFR 522.2340	no	B
2,4,5-T	none	yes	A-3*

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
TDE (metabolite of DDT)	40 CFR 180.147	yes	A
TDE (or DDD)	40 CFR 180.187	yes	A
Tebuthiuron	40 CFR 180.390	no	D
Terbacil	40 CFR 180.209	yes	D
Terbufos	40 CFR 180.352	no	D
Terbuthylazine	40 CFR 180.333	no	A
Terbutryn	40 CFR 180.265	no	A
Terpene polychlorinates	40 CFR 180.164	no	A
Testosterone proprionate	21 CFR 556.710	yes	C
Tetracycline hydrochloride	21 CFR 556.720 21 CFR 546.180,a,h,i	yes	B-3*
Tetradifon	40 CFR 180.174	yes	D
Thiabendazole	21 CFR 556.730 40 CFR 180.242 21 CFR 558.615 21 CFR 520.2380	yes	B-2*
Thiamylal, Sodium	21 CFR 522.2424	no	D
Thidiazuron	40 CFR 180.403	no	D
Thiobencarb	40 CFR 180.401	no	D
Thiophanate-methyl and oxygen analog	40 CFR 180.371	no	D
Thiram	40 CFR 180.132	yes[1]	D
Tiamulin	21 CFR 556.738 21 CFR 520.2455	no	ZZ*
Toxaphene	40 CFR 180.138	yes	A-2*
Triamcinolone acetonide	21 CFR 520.2482	no	C

[1]Polyram is part of the trade name Polyram Ultra, which is thiram; zineb and maneb, q.v., may also be associated with Polyram.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

Compound Name	CFR or NADA Reference	Listed in 1979 GAO Report	Ranking
S,S,S-Tributyl phosphorotrithioate	40 CFR 180.272	yes[1]	D
Trichlorfon	40 CFR 180.198[2] 21 CFR 520.2520	yes	B-3*
3,5,6-Trichloro-2-pyridinol (metabolite of chlorpyrifos)	40 CFR 180.342	no	B
3,5,6-Trichloro-2-pyridinol (metabolite of chlorpyrifos-methyl)	40 CFR 180.419	no	B
3,5,6-Trichloro-2-pyridinol (metabolite of triclopyr)	40 CFR 180.417	no	B
Triclopyr and metabolite	40 CFR 180.417	no	D
Tricyclohexyltin hydroxide	40 CFR 180.144	yes[3]	D
Trifluralin	40 CFR 180.207	no	C-4*
Triphenyltin hydroxide	40 CFR 180.236	no	B-4*
Tylosin	21 CFR 556.740 21 CFR 520.2640 21 CFR 522.2640 21 CFR 524.2640 21 CFR 558.625	yes	Z-3*
Virginiamycin	21 CFR 556.750 21 CFR 558.635	yes	B
Xylazine	21 CFR 522.2662	no	Z-4*
Zeranol	21 CFR 556.760 21 CFR 522.2680	yes	C-2*
Zinc	none	no	D-4*
Zinc ion and maneb, coordination product	40 CFR 180.176	yes	D
Zineb	40 CFR 180.115	yes	D
Zoalene	21 CFR 556.770	yes	B

[1]As DEF.
[2]As dimethyl (2,2,2-trichloro-1-hydroxyethyl)phosphonate
[3]As Plictran.

*Ranked under CES.

LIST OF COMPOUNDS CONSIDERED

NOTE

Compounds Ranked Under Compound Evaluation System (CES)
(See discussion on 3.A.3-4.)

Compound	*Original Rank*	*2-Value Ranking*
Aflatoxin	D	A-4
Alachlor	D	A-2
Albendazole	D	A-2
Aldicarb	D	A-4
Aldrin	A	A-3
Ampicillin	A	B-2
Ampicillin trihydrate	A	B-2
Arsanilic acid	A	C-1
Atrazine	A	C-3
Azaperone	D	B-4
Benomyl	D	B-3
BHC	D	B-2
Cadmium	D	B-4
Captan	D	B-3
Carbadox	B	A-3
Carbarsone	A	C-2
Carbofuran	C	C-3
Carboxin	D	C-4
Chloramphenicol	A	A-2
Chloramphenicol palmitate	A	A-2
Chlordane (technical)	A	A-2
Chlorpyrifos	B	B-4
2,4,D (technical)	B	B-2
Dalapon	A	A-3
Daminozide	D	B-3
Decoquinate	D	Z-4*
Dichlorvos	C	B-4
Dimethoate	D	B-3
Diphenylamine	D	B-4
Endrin	A	A-3
Ethylene dibromide	D	A-4
Fenbendazole	B	B-3
Fenthion	B	C-3
Furazolidone	B	A-1
Gentamicin sulfate	A	B-2
Heptachlor and heptachlor epoxide	A	A-1
Hexazinone	D	D-4
Ipronidazole	B	Z-4*
Ipronidazole hydrochloride	B	Z-4*
Ivermectin	D	B-1
Lead	D	B-4
Levamisole	A	C-2
Levamisole hydrochloride	A	C-2
Lindane	A	A-2
Mebendazole	B	B-4

*The letter Z is used to designate an element of the two-value system lacking the information needed for classification.

LIST OF COMPOUNDS CONSIDERED

NOTE *Compounds Ranked Under Compound Evaluation System (CES)*

Compound	*Original Rank*	*2-Value Ranking*
Methoxychlor	A	D-4
Methyl bromide	D	B-4
Methylene chloride	D	A-2
Monensin	A	B-3
Naled	B	B-4
Nitrofurazone	C	B-1
Neomycin sulfate	A	B-3
Paraquat	A	A-4
PCB's	D	A-4
PCP	D	B-1
Permethrin	D	B-2
Prometryne	C	C-3
Roxarsone	A	C-1
Silvex	D	A-3
Streptomycin	A	A-3
Sulfamethazine	A	B-1
Sulfaquinoxaline	A	B-1
Sulfathiazole	A	B-1
Thiabendazole	A	B-2
2,4,5-T	D	A-3
Tetracycline hydrochloride	A	B-3
Tiamulin	D	ZZ*
Toxaphene	A	A-2
Trichlorfon	C	B-3
Trifluralin	C	C-4
Triphenyltin hydroxide	D	B-4
Tylosin	A	Z-3*
Xylazine	D	Z-4*
Zeranol	B	C-2
Zinc	D	D-4

*The letter Z is used to designate an element of the two-value system lacking the information needed for classification

CROSS-REFERENCED COMPOUNDS

Introduction

CFR names have been used wherever possible in this fourth edition of the Compound Evaluation and Analytical Capability Document. This provides uniformity in nomenclature, but can cause difficulties in locating or identifying certain compounds that have been designated by common or trade names in other places. The cross-reference section is intended to eliminate some of these difficulties. The section includes:

- Names used in the 1979 GAO Report that do not follow CFR usage
- Common and trade names used in the tolerance section of the first edition
- Compounds almost universally known by a common name or trade name
- Compounds identified by different names in different sections of the CFR

CROSS-REFERENCED COMPOUNDS

4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)one	metribuzin, Sencor
azinphosmethyl	O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl] phosphorodithioate
bambermycins	flavomycin
bendiocarb	Ficam
benzene hexachloride	BHC
BHC	benzene hexachloride
4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (name used in 40 CFR)	crufomate (name used in 21 CFR), Ruelene
carbophenothion	Trithion
chlordecone	Kepone
chlorfenvinphos	2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate
chlorobenzilate	ethyl 4,4′-dichlorobenzilate
2-chloro-1-(2,4-dichlorophenyl)vinyl diethyl phosphate	chlorfenvinphos
2-chloro-N-isopropylacetanilide	propachlor
2-chloro-1(2,4,5-trichlorophenyl)vinyl dimethyl phosphate	Gardona, tetrachlorvinphos
chlorpyrifos	Dursban
crotoxyphos	dimethyl phosphate of alpha-methylbenzyl 3-hydroxy-cis-crotonate
crufomate (name used in 21 CFR)	4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (name used in 40 CFR), Ruelene
cyano(3-phenoxyphenyl) methyl-4-chloro-alpha-methylethyl) benzeneacetate	fenvalerate
cyromazine	Larvadex
2,4-DB	4-(2,4-dichlorophenoxy) butyric acid
DEF	S,S,S-tributyl phosphorotrithioate
Diazinon	O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate

CROSS-REFERENCED COMPOUNDS

1,1-dichloro-2,2-bis(p-ethylphenyl) ethane	Perthane
3,5-dichloro-N-(1,1-dimethyl-2-propynyl) benzamide	propyzamide
4-(2,4-dichlorophenoxy) butyric acid	2,4-DB
2,4-dichlorophenyl p-nitrophenyl ether	nitrofen
dichlorvos (name used in 21 CFR)	2,2-dichlorovinyl dimethyl phosphate (name used in 40 CFR)
2,2-dichlorovinyl dimethyl phosphate (name used in 40 CFR)	dichlorvos (name used in 21 CFR)
O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	disulfoton, Disyston
O,O-diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	Diazinon
O,O-diethyl-O-[p-(methylsulfinyl) phenyl] phosphorothioate	fensulfothion
O,O-dimethyl O-p-(dimethylsulfamoyl) phenyl phosphorothioate	famphur
O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl] phosphorodithioate	azinophosmethyl, Guthion
dimethyl phosphate of alpha-methylbenzyl 3-hydroxy-cis-crotonate	crotoxyphos
dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate (name used in 40 CFR)	trichlorfon (name used in 21 CFR)
3,5-dinitrobenzamide	nitromide
disulfoton	O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate
Disyston	O,O-diethyl S-[2-(ethylthio)ethyl] phosphorodithioate
dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta [cd] pentalene	mirex
Dursban	chlorpyrifos
ethyl 4,4′-dichlorobenzilate	chlorobenzilate
O-ethyl-O-[4-(methylthio)phenyl] S-propyl phosphorodithioate	sulprofos

S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate	oxydemetonmethyl
famphur	O,O-dimethyl O-p-(dimethylsulfamoyl) phenyl phosphorothioate
fenbutatin oxide	hexakis (2-methyl-2-phenylpropyl) distannoxane
fenridazone-potassium	potassium salt of 1-(4-chlorophenyl)-1,4-dihydro-6-methyl-4-oxo-pyridazine-3-carboxylic acid
fensulfothion	O,O-diethyl-O-[p-(methylsulfinyl) phenyl] phosphorothioate
fenvalerate	cyano(3-phenoxyphenyl) methyl-4-chloro-alpha-(methylethyl) benzeneacetate
Ficam	bendiocarb
flavomycin	bambermycins
Gardona	2-chloro-1(2,4,5-trichlorophenyl)vinyl dimethyl phosphate, tetrachlorvinphos
Guthion	O,O-dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl)methyl] phosphorodithioate
"hexakis"	hexakis (2-methyl-2-phenylpropyl) distannoxane
hexakis (2-methyl-2-phenylpropyl) distannoxane	fenbutatin oxide, "hexakis"
isofenphos	1-methylethyl 2-((ethoxy-((1-methylethyl) amino) phosphinothioyl)oxy)benzoate
Kepone	chlordecone
Larvadex	cyromazine
N-(mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorodithioate	phosmet
6-methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one	oxythioquinox
1-methylethyl 2-((ethoxy-1((methylethyl)amino) phosphinothioyl)oxy)benzoate	isofenphos
metribuzin	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
mirex	dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta [cd] pentalene

CROSS-REFERENCED COMPOUNDS

nitrofen	2,4-dichlorophenyl p-nitrophenyl ether
nitromide	3,5-dinitrobenzamide
oxydemetonmethyl	S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate
oxythioquinox	6-methyl-1,3-dithiolo[4,5-b]quinoxalin-2-one
Perthane	1,1-dichloro-2,2-bis(p-ethylphenyl) ethane
phosmet	N-(mercaptomethyl) phthalimide S-(O,O-dimethyl phosphorodithioate
Plictran	tricyclohexyltin hydroxide
"Polyram"	a partial trade name; possibly refers to thiram, zineb, or maneb
potassium salt of 1-(4-chlorophenyl-1,4-dihydro-6-methyl-4-oxo-pyridizine-3-carboxylic acid	fenridazone-potassium
propachlor	2-chloro-N-isopropylacetanilide
propanil	Stam
propyzamide	3,5-dichloro-N-(1,1-dimethyl-2-propynyl) benzamide
Ruelene	4-tert-butyl-2-chlorophenyl methyl methylphosphoramidate (see crufomate)
Sencor	4-amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one
Stam	propanil
Strobane	terpene polychlorinates
sulprofos	O-ethyl-O-[4-(methylthio)phenyl] S-propyl phosphorodithioate
terpene polychlorinates	Strobane
tetrachlorvinphos	2-chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate, Gardona
S,S,S-tributyl phosphorotrithioate	DEF
trichlorfon (name used in 21 CFR)	dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate (named used in 40 CFR)
tricyclohexyltin hydroxide	Plictran
Trithion	carbophenothion

Section 4

RESIDUE LIMITS

Introduction

This section provides information on residue limits in meat and poultry products applied by FSIS (as of September 1, 1986). These limits include tolerances and action levels developed by the Environmental Protection Agency (EPA) for pesticide chemicals and by the Food and Drug Administration (FDA) for animal drugs and unavoidable contaminants. Formal tolerances are not established in all cases; for some unavoidable contamination situations, FDA and EPA, upon request, recommend action levels to FSIS. FSIS will condemn product as adulterated when the residue level found exceeds a limit listed here or, for pesticide chemical and drug residues, when there is no applicable limit or exemption.

The residue limits for poultry and livestock species are listed alphabetically by compound (which may include a substance's metabolites). The entries include, among other things, Code of Federal Regulations (CFR) citations for tolerances and "AL" notations for action levels. For animal drugs with "zero" or "no residue" tolerances, the entries also include, in parenthesis, the limits of quantification considered by FDA in approving uses of those drugs in food producing animals and for enforcement purposes, and applied by FSIS in determining if product is adulterated.

RESIDUE LIMITS

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Acephate and metabolite	40 CFR 180.108	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
2-Acetyl-amino-5-nitrothiazole	21 CFR 556.20	—	—	—	0.1Et[1]	—
Aklomide and metabolite	21 CFR 556.30	—	—	—	4.5L[2] 4.5M[2] 3Sf[2]	—
Alachlor and metabolites	40 CFR 180.249	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Aldicarb and metabolites	40 CFR 180.269	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	—	0.01F 0.01M 0.01Mb
Aldrin	MPI Dir 917.1	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)
(Alpha RS,2R)-fluvalinate [(RS)-alpha-cyano-3-phenoxy-benzyl(R)-2-[2-chloro-4-(trifluoromethyl) anilino]-3-methyl-butanoate]	40 CFR 180.427	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb
4-Amino-6-(1,1-dimethylethyl)-3-(methylthio)-1,2,4-triazin-5(4H)-one and metabolites	40 CFR 180.332	0.7F 0.7M 0.7Mb	0.7F 0.7M 0.7Mb	0.7F 0.7M 0.7Mb	0.7F 0.7M 0.7Mb	0.7F 0.7M 0.7Mb
Amitraz and metabolites[3]	40 CFR 180.287	0.1F 0.05M 0.3Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb

[1]Turkeys only.
[2]Chickens only.
[3]Tolerances for goats, sheep, swine, poultry, and horses established until April 2, 1987.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Amoxicillin	21 CFR 556.38	0.01Et	—	—	—	—
Ampicillin	21 CFR 556.40	0.01Et	—	0.01Et	—	
Amprolium	21 CFR 556.50	2.0F[1] 0.5K[1] 0.5L[1] 0.5M[1]	—	—	1K[2] 1L[2] 0.5M[2]	—
Apramycin	21 CFR 556.52	—	—	0.4F[3] 0.4K[3] 0.3L[3] 0.1M[3]	—	—
Arsenic	21 CFR 556.60	—	—	2K 2L 0.5M 0.5Mb	0.5M 2Mb	—
Atrazine	40 CFR 180.220	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Bacitracin	21 CFR 556.70	0.5Et	—	0.5Et	0.5Et[4]	—
Benomyl and metabolites	40 CFR 180.294	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.2L 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Bentazon and metabolite	40 CFR 180.355	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—
BHC	51 FR 25697	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)
3,6-Bis(2-chlorophenyl) 1,2,4,5-tetrazine[5]	none	0.01F 0.05K 0.1L 0.01M 0.01Mb	—	—	—	—

[1]Calves only.
[2]Chickens and turkeys.
[3]Total residues.
[4]Also pheasant and quail.
[5]Tolerances established until March 13, 1987.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

RESIDUE LIMITS

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Bromoxynil	40 CFR 180.324	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb
Buquinolate	21 CFR 556.90	—	—	—	0.4K[1] 0.4L[1] 0.1M[1] 0.4Sf[1]	—
sec-Butyl-amine	40 CFR 180.321	0.75F 3K 0.75M 0.75Mb	—	—	—	—
4-tert-Butyl-2-chlorophenyl methyl methylphosphoramidate and metabolite	40 CFR 180.295	1F 1M 1Mb	1F 1M 1Mb	—	—	—
Cacodylic acid (as As_2O_3)	40 CFR 180.311	0.7F 1.4K 1.4L 0.7M 0.7Mb	—	—	—	—
Captan	40 CFR 180.103	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb	—	—
Carbadox and metabolite	21 CFR 556.100	—	—	0(0.030)Et	—	—
Carbaryl and metabolites	40 CFR 180.169	0.1F 1K 1L 0.1M 0.1Mb	0.1F 1K 1L 0.1M 0.1Mb	0.1F 1K 1L 0.1M 0.1Mb	5F 5M	0.1F 1K 1L 0.1M 0.1Mb
Carbofuran[2] and metabolites	40 CFR 180.254	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb

[1]Chickens only.
[2]No more than 0.02 can be the carbamate.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Carbomycin	21 CFR 556.110	—	—	—	0(0.5)Et[1]	—
Carbophenothion	40 CFR 180.156	0.1F	0.1F	0.1F	—	—
Carboxin and metabolite	40 CFR 180.301	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Cephapirin	21 CFR 556.115	0.1Et	—	—	—	—
Chlorbromuron and metabolites	40 CFR 180.279	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Chlordane	MPI Dir 917.1	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)
Chlordimeform and metabolites	40 CFR 180.285	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb
Chlorhexidine	21 CFR 556.120	0(0.001)Et[2]	—	—	—	—
2-Chloro-1-(2,4-dichlorophenyl) vinyl diethyl phosphate	40 CFR 180.322	0.2F	0.2F[3]	0.005F	0.005F	0.005F
2-Chloro-N-isopropylacetanilide	40 CFR 180.211	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Chloroneb and metabolite	40 CFR 180.257	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	—	0.2F 0.2M 0.2Mb
1-(4-Chlorophenoxy)-3,3-dimethyl-1-(1H-1,2-4-triazol-1-yl)-2-butanone and metabolites	40 CFR 180.410	1.0F 1.0M 1.0Mb	1.0F 1.0M 1.0Mb	0.04F 0.04M 0.04Mb	0.04F 0.04M 0.04Mb	1.0F 1.0M 1.0Mb

[1]Chickens only.
[2]Calves only.
[3]Sheep only; goats 0.005F.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
2-(m-Chlorophenoxy) propionic acid	40 CFR 180.325	0.05F 0.5K 0.05M 0.05Mb	0.05F 0.5K 0.05M 0.05Mb	0.05F 0.5K 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.5K 0.05M 0.05Mb
2-Chloro-1-(2,4,5-trichlorophenyl) vinyl dimethyl phosphate	40 CFR 180.252	1.5F	0.5F	1.5F	0.75F	0.5F
Chlorpyrifos and metabolite	40 CFR 180.342	2.0F 2.0M 2.0Mb	1.0F 1.0M 1.0Mb	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb	1.0F 1.0M 1.0Mb
Chlorpyrifos-methyl and metabolite	40 CFR 180.419	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb
Chlorsulfuron	40 CFR 180.405	0.3F 0.3M 0.3Mb	0.3F 0.3M 0.3Mb	0.3F 0.3M 0.3Mb	—	0.3F 0.3M 0.3Mb
Chlortetracycline	21 CFR 556.150	0F[1] 0.1K[1] 0.1L[1] 0.1M[1]	 1K[2] 0.5L[2] 0.1M[2]	0.2F 4K 2L 1M	1F 4K 1L 1M 1S	—
Clopidol	21 CFR 556.160	3K 1.5L 0.2M	3K 1.5L 0.2M	0.2Et	15K 15L 5M	—
Clorsulon	21 CFR 556.163	1.0K[3]	—	—	—	—
Cloxacillin	21 CFR 556.165	0.01 Et	—	—	—	—
Coumaphos and oxygen analog	40 CFR 180.189	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb

[1]Cattle only; calves 1F, 4K, 4L, 1M.
[2]Sheep only.
[3]Tolerance for clorsulon; corresponds to 3.0 total residues in kidney; safe concentrations 4.0F, 3.0K, 2.0L, 1.0M.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Cyano(3-phenoxy-phenyl)methyl-4-hloro-a-(methylethyl) benzeneacetate	40 CFR 180.379	1.5F 1.5M 1.5Mb	1.5F 1.5M 1.5Mb	1.5F 1.5M 1.5Mb	—	1.5F 1.5M 1.5Mb
Cypermethrin[1]	40 CFR 180.418	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb
Cyromazine	40 CFR 180.414	—	—	—	0.05F[2] 0.05M[2] 0.05Mb[2]	—
2,4-D and metabolite	40 CFR 180.142	0.2F 2K 0.2M 0.2Mb	0.2F 2K 0.2M 0.2Mb	0.2F 2K 0.2M 0.2Mb	0.05F 0.05K 0.05M 0.05Mb	0.2F 2K 0.2M 0.2Mb
Dalapon	40 CFR 180.150	0.2M 0.2Mb	0.2M 0.2Mb	0.2M 0.2Mb	3Ek 9K	—
Daminozide	40 CFR 180.246	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb 2K	0.2F 0.2M 0.2Mb
DDT and metabolites	40 CFR 180.147 MPI Dir. 917.1	5F	5F	5F	5F(AL)	5F
Decoquinate	21 CFR 556.170	2Et 1Sm	—	—	2Et[3] 1Sm[3]	—
Dialifor and oxygen analog	40 CFR 180.326	0.15F 0.15M 0.15Mb	0.15F 0.15M 0.15Mb	—	0.05F 0.05M 0.05Mb	—

[1]Tolerances established until December 31, 1989.
[2]Chicken layer hens only; tolerance for parent cyromazine; an additional tolerance of 0.05F, M, Mb exists for the metabolite, melamine.
[3]Chickens only.

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L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Dicamba and metabolite	40 CFR 180.227	0.2F 1.5K 1.5L 0.2M 0.2Mb	0.2F 1.5K 1.5L 0.2M 0.2Mb	0.2F 1.5K 1.5L 0.2M 0.2Mb	—	0.2F 1.5K 1.5L 0.2M 0.2Mb
3,5-Dichloro-N-(1,1-dimethyl-2-propynyl) benzamide and metabolites	40 CFR 180.317	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb	0.02F 0.2K 0.2L 0.02M 0.02Mb
1,1-Dichloro-2,2-bis (p-ethylphenyl) ethane	40 CFR 180.139	0M	0M	0M	0M	0M
Dichlorvos	40 CFR 180.235 21 CFR 556.180	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.1F 0.1M 0.1Mb	0.05F 0.05M 0.05Mb	0.02F 0.02M 0.02Mb
Dieldrin	MPI Dir 917.1	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)
O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	40 CFR 180.153	0.7F 0.7M 0.7Mb	0.7F[1] 0.7M[1] 0.7Mb[1]	—	—	—
O,O-Diethyl O-(p-(methylsulfinyl) phenyl phosphorothioate and metabolites	40 CFR 180.234	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	—	0.02F 0.02M 0.02Mb
Difenzoquat	40 CFR 180.369	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Diflubenzuron	40 CFR 180.377	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
2,3-Dihydro-5,6-dimethyl-1,4-dithiin-1,1,4,4-tetraoxide	40 CFR 180.406	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	—	0.02F 0.02M 0.02Mb

[1]Sheep only.

KEY

(AL): Action level	M: Muscle
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F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Dihydrostreptomycin	21 CFR 556.200	0(0.5)Et[1,2]	—	—	—	—
Dimethoate and oxygen analog	40 CFR 180.204	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
O,O-Dimethyl S-[(4-oxo-1,2,3-benzotriazin-3(4H)-yl) methyl] phosphorodithioate	40 CFR 180.154	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	—	0.1F 0.1M 0.1Mb
O,O-Dimethyl O-p (dimethylsulfamoyl) phenyl phosphorothioate and oxygen analog	40 CFR 180.233	0.1F 0.1M 0.1Mb	—	—	—	—
Dimethyl phosphate of a-methylbenzyl 3-hydroxy-cis-crotonate	40 CFR 180.280	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	—	—
N,N-Dimethyl-piperidinium chloride	40 CFR 180.384	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Dimetridazole	21 CFR 556.210	—	—	—	0(0.002)Et[3]	—
3,5-Dinitrobenzamide	21 CFR 556.220	—	—	—	0(0.020)Et[4]	—
Dioxathion	40 CFR 180.171	1F	1F	1F	—	1F
Diphenamid	40 CFR 180.230	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb
Diphenylamine	40 CFR 180.190	0M	0M	0M	0M	0M
Dipropyl isocinchomeronate	40 CFR 180.143 40 CFR 180.319[5]	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb

[1]Calves only.
[2]Administrative tolerance in calves and cattle 2.0K.
[3]Turkeys only.
[4]Chickens only.
[5]Interim tolerance.

KEY

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Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Diquat	40 CFR 180.226	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Diuron	40 CFR 180.106	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	—	1F 1M 1Mb
Dodecachloroocta-hydro-1,3,4-metheno-2H-cyclobuta(cd) pentalene	40 CFR 180.251	0.1F	0.1F	0.1F	0.1F	0.1F
Dodine	40 CFR 180.172	0M	0M	0M	0M	0M
Endosulfan and metabolite	40 CFR 180.182	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	—	0.2F 0.2M 0.2Mb
Endrin	MPI Dir 917.1	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)	0.3F(AL)
Erythromycin	21 CFR 556.230	0(0.3)Et	—	0.1Et	0.125Et	—
Estradiol benzoate	21 CFR 556.240	480F[1] 360K[1] 240L[1] 120M[1]	600F[2] 600K[2] 600L[2] 120M[2]	—	—	—
Estradiol monopalmitate	21 CFR 556.250	—	—	—	0(0.002)Et[3]	—
Ethephon	40 CFR 180.300	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb
Ethion and oxygen analog	40 CFR 180.173	2.5F 2.5M[4] 1.0Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb

[1]Heifers, steers, and calves (ppt); above concentrations naturally present.
[2]Lambs only (ppt); above concentrations naturally present.
[3]Chickens only.
[4]Fat basis.

KEY

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Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Ethofumesate and metabolites	40 CFR 180.345	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb
Ethopabate	21 CFR 556.260	—	—	—	1.5K[1] 1.5L[1] 0.5M[1]	—
2-(1-(Ethoxyimino)-butyl)-5-(2-ethylthio)-propyl)-3-hydroxy-2-cyclohexene-1-one and metabolites	40 CFR 180.412	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
5-Ethoxy-3-(trichloro-methyl)-1,2,4-thiadiazole and metabolite	40 CFR 180.370	0.10F 0.10M 0.10Mb	0.10F 0.10M 0.10Mb	0.10F 0.10M 0.10Mb	0.10F 0.10M 0.10Mb	0.10F 0.10M 0.10Mb
Ethyl 4,4'-dichloro-benzilate (chlorobenzilate)	40 CFR 180.109	0.5F 0.5M 0.5Mb	0.5F[2] 0.5M[2] 0.5Mb[2]	—	—	—
Ethyl 3-methyl-4-(methylthio) phenyl (1-methylethyl) phosphoramidate	40 CFR 180.349	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb
O-Ethyl-O-[4-(methyl-thio)phenyl] S-propyl phosphorodithioate and metabolites	40 CFR 180.374	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.01F 0.01M 0.01Mb	0.1F 0.1M 0.1Mb
S-[2-(Ethylsulfinyl)-ethyl] O,O-dimethyl phosphorothioate and metabolites	40 CFR 180.330	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	—	0.01F 0.01M 0.01Mb
Fenbendazole	21 CFR 556.275	0.8L[3]	—	—[4]	—	—

[1]Chickens only.
[2]Sheep only.
[3]Tolerance for parent fenbendazole; corresponds to 10 ppm total residues in liver; safe concentrations 20F, 15K, 10L, 5M.
[4]Tolerance for marker residues not needed. Safe concentrations of total residues 20F, 20K, 15L, 5M, 20S.

KEY

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F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Fenprostalene	21 CFR 556.277	—[1]	—	—	—	—
Fenthion and metabolites	40 CFR 180.214	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—
Fluazifop and butyl ester	40 CFR 180.411	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Flucythrinate	40 CFR 180.400	1.0F 0.1M 0.1Mb	1.0F 0.1M 0.1Mb	1.0F 0.1M 0.1Mb	—	1.0F 0.1M 0.1Mb
Fluridone	40 CFR 180.420	0.05F 0.1K 0.1L 0.05M 0.05Mb	0.05F 0.1K 0.1L 0.05M 0.05Mb	0.05F 0.1K 0.1L 0.05M 0.05Mb	0.05F 0.1K 0.1L 0.05M 0.05Mb	0.05F 0.1K 0.1L 0.05M 0.05Mb
Furazolidone	21 CFR 556.290	—	—	0(0.100)Et	—	—
Gentamicin sulfate	21 CFR 556.300	—	—	0.4F 0.4K 0.3L 0.1M	0.1Et[2]	—
Glyphosate and metabolite	40 CFR 180.364	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L
Halofuginone	21 CFR 556.308	—	—	—	0.1L[3]	—
Haloxon	21 CFR 556.310	0.1Et	—	—	—	—
HCB	MPI Dir 917.1	0.5F(AL)	0.5F(AL)	0.5F(AL)	0.5F(AL)	0.5F(AL)

[1]Tolerance for marker residues not needed. Safe concentrations of total residues 40 ppb F, 30 ppb K, 20 ppb L, 10 ppb M, 100 ppb IS (injection site).
[2]Turkeys only.
[3]Broiler chickens only; tolerance for parent halofuginone; corresponds to 0.3 ppm total residues in liver; safe concentrations 0.1M, 0.3L, 0.2Sf.

KEY

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F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

RESIDUE LIMITS

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Heptachlor and heptachlor epoxide	40 CFR 180.104 MPI Dir 917.1	0M 0.3F(AL)[1]	0M 0.3F(AL)[1]	0M 0.3F(AL)[1]	0M 0.3F(AL)[1]	0M 0.3F(AL)[1]
Hexakis (2-methyl-2-phenylpropyl) distannoxane	40 CFR 180.362	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb	0.5F 0.5M 0.5Mb	0.1F 0.1M 0.1Mb	0.5F 0.5M 0.5Mb
Hexazinone and metabolites	40 CFR 180.396	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Hygromycin B	21 CFR 556.330	—	—	0Et (0.9M) (1.4K)	0Et (0.9M) (1.4K)	—
Imazalil and metabolites	40 CFR 180.413	0.01F 0.50L 0.01M 0.01Mb	0.01F 0.50L 0.01M 0.01Mb	0.01F 0.50L 0.01M 0.01Mb	—	0.01F 0.50L 0.01M 0.01Mb
Iprodione and metabolites	40 CFR 180.399	0.5F 3.0K 3.0L 0.5M 0.5Mb	0.5F 3.0K 3.0L 0.5M 0.5Mb	0.5F 3.0K 3.0L 0.5M 0.5Mb	2.0F 3.0L 0.5M 0.5Mb	0.5F 3.0K 3.0L 0.5M 0.5Mb
Ipronidazole and metabolite	21 CFR 556.340	—	—	—	0(0.002)Et[2]	—
Isopropyl carbanilate (IPC)	40 CFR 180.319[3]	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Isopropyl m-chlorocarbanilate (CIPC)	40 CFR 180.319[3]	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Ivermectin	21 CFR 556.344	15L[4]	—	20L[5]	—	—

[1] In enforcing this action level, the combined concentrations of heptachlor, chlordane, and their metabolites will be used.
[2] Turkeys only.
[3] Interim tolerance.
[4] Tolerance in ppb for 22,23-dihydroavermectin B_1a; corresponds to 50 ppb total residues in liver; safe concentrations 100 ppb F, 75 ppb K, 50 ppb L, 25 ppb M.
[5] Tolerance in ppb for 22,23-dihydroavermectin B_1a; corresponds to 75 ppb total residues in liver; safe concentrations 100 ppb F, K; 75 L; 25 M.

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L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Lasalocid	21 CFR 556.347	0.7L[1]	—[2]	—	0.3Sf[3]	—
Levamisole hydrochloride	21 CFR 556.350	0.1Et	0.1Et[4]	0.1Et	—	—
Lincomycin	21 CFR 556.360	—	—	0.1Et	0.1Et[5]	—
Lindane	40 CFR 180.133 MPI Dir. 917.1	7F	7F	4F	4F(AL)	7F
Linuron	40 CFR 180.184	1F 1M 1Mb	1F 1M 1Mb	1F 1M 1Mb	— — —	1F 1M 1Mb
Malathion	40 CFR 180.111	4F 4M 4Mb	4F 4M 4Mb	4F 4M 4Mb	4F 4M 4Mb	4F 4M 4Mb
Melengestrol acetate	21 CFR 556.380	0(0.025)Et	—	—	—	—
N-(Mercaptomethyl) phthalimide S-(O,O-dimethyl phosphoro-dithioate) and oxygen analog	40 CFR 180.261	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	—	0.2F 0.2M 0.2Mb
Metalaxyl and metabolites	40 CFR 180.408	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 0.05Mb	0.4F 0.4K 0.4L 0.05M 1.0Mb
Methoprene	40 CFR 180.359	0.3F 0.1M 0.1Mb	0.3F 0.1M 0.1Mb	0.3F 0.1M 0.1Mb	0.5F 0.5M 0.05Mb	0.3F 0.1M 0.1Mb
Methoxychlor	40 CFR 180.120 MPI Dir. 917.1	3F	3F	3F	3F(AL)	3F

[1]Tolerance for parent lasalocid; corresponds to 4.8 total residues in liver; safe concentrations 4.8F, 3.6K, 4.8L, 1.2M

[2]Tolerance for marker residue not needed. Sheep only; safe concentrations of total residues 6F, 6K, 6L, 1.2M.

[3]Chickens only; tolerance for parent lasalocid; corresponds to 7.2 total residues in liver; safe concentrations 7.2L, 1.2M, 2.4Sf.

[4]Sheep only.

[5]Chickens only.

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K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
2-Methyl-4-chlorophenoxyacetic acid and metabolite	40 CFR 180.339	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb
6-Methyl-1,3-dithiolo (4,5-b) quinoxalin-2-one	40 CFR 180.338	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	—	0.05F 0.05M 0.05Mb
1-Methylethyl 2-((ethoxy((1-methyl-ethyl)amino) phosphinothioyl)oxy) benzoate and metabolites	40 CFR 180.387	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Metolachlor and metabolites	40 CFR 180.368	0.02F 0.2K 0.05L 0.02M 0.02Mb	0.02F 0.2K 0.05L 0.02M 0.02Mb	0.02F 0.2K 0.05L 0.02M 0.02Mb	0.02F — 0.05L 0.02M 0.02Mb	0.02F 0.2K 0.05L 0.02M 0.02Mb
Metoserpate hydrochloride	21 CFR 556.410	—	—	—	0.02Et[1]	—
Metsulfuron methyl	40 CFR 180.428	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb
Monensin	21 CFR 556.420	0.05Et	—	—	—[2]	—
Morantel tartrate	21 CFR 556.425	0.70L[3]	—	—	—	—
Naled and metabolite	40 CFR 180.215	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Narasin	21 CFR 556.428	—	—	—	—[4]	—
Neomycin	21 CFR 556.430	0.25Et[5]	—	—	—	—

[1]Chickens only.
[2]Chickens only; tolerance for marker residue not needed; safe concentrations for total residues 1.5M. 3.0Sf, 4.5L.
[3]Tolerance for marker residue N-methyl-1,3-propanediamine (MAPA); corresponds to 2.40 ppm total residues in liver; safe concentrations for total residues 4.80F, 3.60K, 2.40L, 1.20M.
[4]Chickens only; tolerance not needed; safe concentrations 1.2F, 1.8L, 0.6M, 1.2Sf.
[5]Calves only.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Nequinate	21 CFR 556.440	—	—	—	0.1Et[1]	—
Nicarbazin	21 CFR 556.445	—	—	—	4K[1] 4L[1] 4M[1] 4S[1]	—
Nicotine	40 CFR 180.167a 40 CFR 180.319[2]	—	—	—	1F 1M 1Mb	—
Nitrapyrin and metabolite	40 CFR 180.350	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Norflurazon	40 CFR 180.356	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Novobiocin	21 CFR 556.460	1Et	—	—	1Et	—
Nystatin	21 CFR 556.470	—	—	0(5.6)Et	0(5.6)Et	—
N-Octyl bicyclo-heptenedicarboximide	40 CFR 180.367	0.3F	0.3F	0.3F	—	0.3F
Oleandomycin	21 CFR 556.480	—	—	0.15Et	0.15Et	—
Ormetoprim	21 CFR 556.490	—	—	—	0.1Et	—
Oxadiazon and metabolites	40 CFR 180.346	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	—	0.01F 0.01M 0.01Mb
Oxyfluorfen and metabolites	40 CFR 180.381	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb

[1]Chickens only.
[2]Interim tolerance.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Oxytetracycline	21 CFR 556.500	0.1Et	—	0.1Et	1F 3K 1L 1M 1S	—
Paraquat	40 CFR 180.205	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb	0.01F 0.01M 0.01Mb
PCB's[1]	21 CFR 109.30 46 FR 39224	3F(AL)	3F(AL)	3F(AL)	3F	3F(AL)
Penicillin	21 CFR 556.510	0.05Et	0(0.04)Et	0(0.04)Et	0(0.04)Et[2]	—
Permethrin and metabolites	40 CFR 180.378	2.0F 0.15M 1.0Mb	2.0F 0.15M 1.0Mb	2.0F 0.15M 3.0Mb	0.05F 0.05M 0.05Mb	2.0F 0.15M 1.0Mb
Phenothiazine	40 CFR 180.319[3]	2F 2M 2Mb	—	—	—	—
Phorate and metabolites	40 CFR 180.206	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Phosalone	40 CFR 180.263	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	0.25F 0.25M 0.25Mb	—	0.25F 0.25M 0.25Mb
Picloram	40 CFR 180.292	0.2F 5K 0.5L 0.2M 0.2Mb	0.2F 5K 0.5L 0.2M 0.2Mb	0.2F 5K 0.5L 0.2M 0.2Mb	0.05F 0.05M 0.05Mb	0.2F 5K 0.5L 0.2M 0.2Mb
Piperonyl butoxide	40 CFR 180.127	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	3F 3M 3Mb	0.1F 0.1M 0.1Mb

[1]The processed product tolerance for residues of PCB's in infant and junior foods is 0.2 ppm [21 CFR 109.30(a)(8)]

[2]Chickens, pheasants, and quail; turkeys 0.01Et; ducks and geese 0.01Et(AL).

[3]Interim tolerance.

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K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Pirimiphos-methyl and metabolites	40 CFR 180.409	0.2F 2.0K 2.0L 0.2M 0.2Mb	0.2F 2.0K 2.0L 0.2M 0.2Mb	0.2F 2.0K 2.0L 0.2M 0.2Mb	0.2F — — 2.0 2.0Mb	0.2F 2.0K 2.0L 0.2M 0.2Mb
Potassium arsenite (as As_2O_3)	40 CFR 180.334	0.7F 2.7K 2.7L 0.7M 0.7Mb	—	—	—	0.7F 2.7K 2.7L 0.7M 0.7Mb
Potassium salt of 1-(4-chlorophenyl)-1,4-dihydro-6-methyl-4-oxo-pyridazine-3-carboxylic acid	40 CFR 180.423	0.05F 1.0K 1.0L 0.05M 0.05Mb	0.05F 1.0K 1.0L 0.05M 0.05Mb	0.05F 1.0K 1.0L 0.05M 0.05Mb	0.30F — — 0.30M 0.30Mb	0.05F 1.0K 1.0L 0.05M 0.05Mb
Profenofos and metabolites	40 CFR 180.404	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb	0.05F 0.05M 0.05Mb
Profluralin	40 CFR 180.348	0.02F 0.02M 0.0Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Progesterone	21 CFR 556.540	12F[1] 9K[1] 6L[1] 3M[1]	15F[2] 15K[2] 15L[2] 3M[2]	—	—	—
Propanil and metabolites	40 CFR 180.274	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb
Propargite	40 CFR 180.259	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb

[1]Steers and calves (ppb); above concentrations naturally present.
[2]Lambs (ppb); above concentrations naturally present.

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F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Pyrantel tartrate	21 CFR 556.560	—	—	10K 10L 1M	—	—
Pyrethrins	40 CFR 180.128	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.2F 0.2M 0.2Mb	0.1F 0.1M 0.1Mb
Robenidine hydrochloride	21 CFR 556.580	—	—	—	0.2F[1] 0.2S[1] 0.1Et[2]	—
Ronnel and metabolites	40 CFR 180.177	10F 4M 4Mb	10F 4M 4Mb	3F 2M 2Mb	0.01F 0.01M 0.01Mb	—
Simazine	40 CFR 180.213	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb
Sodium arsenite (as As_2O_3)	40 CFR 180.335	0.7F 2.7K 2.7L 0.7M 0.7Mb	—	—	—	0.7F 2.7K 2.7L 0.7M 0.7Mb
Sodium salt of aclfluorfen and metabolites	40 CFR 180.383	0.02K 0.02L	0.02K 0.02L	0.02K 0.02L	0.02F 0.02M 0.02Mb	0.02K 0.02L
Sodium sulfachloro-pyrazine monohydrate	21 CFR 556.625	—	—	—	0(0.1)Et[1]	—
Spectinomycin	21 CFR 556.600	—	—	—	0.1Et[1]	—
Streptomycin	21 CFR 556.610	—[3]	—	0(0.5)Et[3]	0(0.5)[3]	—

[1]Chickens only.
[2]Other than fat or skin (chickens only).
[3]Administrative tolerance 2.0K.

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K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Sulfabromomethazine sodium	21 CFR 556.620	0.1Et	—	—	—	—
Sulfachlorpyridazine	21 CFR 556.630	0.1Et[1]	—	0.1Et	—	—
Sulfadimethoxine	21 CFR 556.640	0.1Et	—	—	0.1Et	—
Sulfaethoxypyridazine	21 CFR 556.650	0.1Et	—	0(0.1)Et	—	—
Sulfamethazine	21 CFR 556.670	0.1Et	—	0.1Et	0.1Et	—
Sulfanitran and metabolites	21 CFR 556.680	—	—	—	0(0.1)Et[2]	—
Sulfathiazole	21 CFR 556.690	—	—	0.1Et	—	—
Sulfomyxin	21 CFR 556.700	—	—	—	0(0.1)Et	—
Tebuthiuron and metabolites	40 CFR 180.390	2F 2M 2Mb	2F 2M 2Mb	—	—	2F 2M 2Mb
Terbacil and metabolites	40 CFR 180.209	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	0.1F 0.1M 0.1Mb
Testosterone propionate	21 CFR 556.710	0(0.200)Et[3]	—	—	—	—
Tetracycline	21 CFR 556.720	0.25Et[1]	0.25Et	0.25Et	0.25Et	—
Tetradifon	40 CFR 180.174	0M	0M	0M	0M	0M
Thiabendazole and metabolite	21 CFR 556.730 40 CFR 180.242	0.1Et 0.1F 0.1M 0.1Mb	0.1Et 0.1F 0.1M 0.1Mb	0.1Et 0.1F 0.1M 0.1Mb	— 0.1F 0.1M 0.1Mb	0.1Et 0.1F 0.1M 0.1Mb

[1]Calves only.
[2]Chickens only.
[3]Heifers only.

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F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Thidiazuron and metabolites	40 CFR 180.403	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
Thiobencarb and metabolites	40 CFR 180.401	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb	0.2F 0.2M 0.2Mb
Thiophanate-methyl and metabolites	40 CFR 180.371	0.1F 0.2K 2.5L 0.1M 0.1Mb	0.1F 0.2K 2.5L 0.1M 0.1Mb	0.1F 1.0L 0.1M 0.1Mb	0.1F 0.2L 0.1M 0.1Mb	0.1F 1.0L 0.1M 0.1Mb
Tiamulin	21 CFR 556.738	—	—	0.4L[1]	—	—
Toxaphene	40 CFR 180.138 MPI Dir. 917.1	7F	7F	7F	7F(AL)	7F
S,S,S-Tributyl phosphorotrithioate	40 CFR 180.272	0.02F 0.02M 0.02Mb	0.02F 0.02M 0.02Mb	—	—	—
Trichlorfon	40 CFR 180.198	0.1F 0.1M 0.1Mb	0.1F 0.1M 0.1Mb	—	—	0.1F 0.1M 0.1Mb
Triclopyr and metabolite	40 CFR 180.417	0.05F 0.5K 0.5L 0.05M 0.05Mb	0.05F 0.5K 0.5L 0.05M 0.05Mb	0.05F 0.5K 0.5L 0.05M 0.05Mb	—	0.05F 0.5K 0.5L 0.05M 0.05Mb
Tricyclohexyltin hydroxide and metabolites	40 CFR 180.144	0.2F 0.5K 0.5L 0.2M 0.2Mb	0.2F 0.5K 0.5L 0.2M 0.2Mb	0.2F 0.5K 0.5L 0.2M 0.2Mb	—	0.2F 0.5K 0.5L 0.2M 0.2Mb

[1]Tolerance for 8-a-hydroxymutilin; corresponds to 10.8 total residues in liver; safe concentrations 14.4F, 14.4K, 10.8L, 3.6M.

KEY

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F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Compound	CFR Reference	Cattle	Goats/ Sheep	Swine	Poultry	Horses
		Units are parts per million				
Triphenyltin hydroxide	40 CFR 180.236	0.05K 0.05L	0.05K 0.05L	0.05K 0.05L	—	0.05K 0.05L
Tylosin	21 CFR 556.740	0.2F 0.2K 0.2L 0.2M	—	0.2F 0.2K 0.2L 0.2M	0.2F 0.2K 0.2L 0.2M	—
Virginiamycin	21 CFR 556.750	—	—	0.4F 0.4K 0.3L 0.1M 0.4S	0.2F[1] 0.5K[1] 0.3L[1] 0.1M[1] 0.2S[1]	—
Zeranol	21 CFR 556.760	0(0.020)Et	0(0.020)Et[2]	—	—	—
Zinc ion & maneb, coordination product	40 CFR 180.176	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L	0.5K 0.5L
Zoalene and metabolite	21 CFR 556.770	—	—	—	2F[3] 6K[3] 6L[3] 3M[3]	—

[1]Broiler chickens only.
[2]Sheep only.
[3]Chickens only; turkeys: 3L, 3M.

KEY

(AL): Action level	M: Muscle
Ek: Excluding kidneys	Mb: Meat byproducts
Et: Edible tissue	S: Skin
F: Fat	Sf: Skin with fat
K: Kidney	Sm: Skeletal muscle
L: Liver	—: No tolerance

Section 5

FSIS RESIDUE ANALYTICAL CAPABILITY

Introduction

The Food Safety and Inspection Service (FSIS) requires practical analytical methods for detecting, quantifying, and identifying all residues that may be present in meat, poultry, and their processed products at levels above established safe residue limits. These methods can be used by the Agency for monitoring and surveillance activities to determine whether product is adulterated.

The Agency uses available methodology to take appropriate regulatory action against adulterated products, consistent with the reliability of the analytical data. However, because of the large number of potential residues that may occur in the food chain, practical methods are not available for many compounds of interest.

This section describes the types of methods used by FSIS to conduct analyses (as of September 1, 1986) and their suitability for regulatory use. A list of key terms precedes the method descriptions.

Method Levels

Methods are described in terms of levels of use:

Level I—These are assays with the highest level of credibility. They are unequivocal at the level of interest. They may be single procedures that determine both the concentration and the identity of the analyte, or combinations of determinative methods for concentration and confirmatory methods for definitive identification.

Level II—These are assays that are not unequivocal but are used to determine the concentration of an analyte at the level of interest and to provide some structural information. These methods are reliable enough to be used as reference methods.

Level III—These are screening methods that may generate limited though useful information. These tests detect the presence or absence of a compound or a class of compounds at some concentration level of interest. They are used because of a greater throughput, portability, or convenience than the Level I or Level II methods. The level of reliability has been determined and documented. The hallmark of Level III tests is that *action based on individual positive results requires substantiation based on Level I or Level II methods*, as required by the uncertainty of any individual results.

Methods are further classified according to their status. Within each classification, subgroups are defined according to the extent to which a method was subjected to study. Therefore, whether (or how well) a specific analytical method meets a defined suitability criterion determines its classification and subgroup.

Criteria for Practical Methods

The following criteria have been identified as guidelines for methods suitable for regulatory use.

FSIS RESIDUE ANALYTICAL CAPABILITY

1. The method requires no more than 2-4 hours of analytical time per sample.

2. The method requires no instrumentation not customarily available in a laboratory devoted to trace drug or environmental analysis.

3. Chemical methods have a Minimum Proficiency Level (MPL) at or below the established residue limit and antimicrobial methods have a Minimum Inhibitory Concentration (MIC) at or below the established residue limit.

4. A quality assurance plan (QAP) has been developed for the method.

5. The method has been subjected successfully to an interlaboratory study at 0, ½X, X, and 2X, where X is the analyte concentration at the residue limit.

FSIS considers the methods described for "zero tolerance" compounds to be suitable for regulatory use if they meet the suitability criteria listed above and have an MPL or MIC at the operational definition of zero defined by FDA or EPA. Methods determined to be suitable for regulatory use except for criterion 3 or 5 will be marked with an asterisk (*). In an emergency situation, exceptions to a method's suitability may be necessary.

The method classifications are:

A. AOAC Official Methods. Such a method has been subjected to an interlaboratory study in which five or more laboratories participated. If this collaborative process provides results that establish the acceptability of the method, it is accepted as an official method by the AOAC. Some AOAC official methods have been subsequently studied for extension as follows:

1. Extension to other analytes, tissues, species, and products by a three-analyst (two or three laboratory) study—a validation study.

2. Extension by a one or two analyst intralaboratory or interlaboratory study as follows:

    a. Extended to other tissues, species, and products for the initial analyte(s) studied.

    b. Extended to other similar analytes in the same matrices as initially studied.

B. Validated Methods. Such a method is subjected to an interlaboratory study in two or three laboratories with a minimum of three independent analysts. The resulting data are reviewed by a peer group of

government scientists. The data that result from the study are made available for review upon request. Included in this category would be post-1973 New Animal Drug Application (NADA) methods developed by sponsors that have been successfully studied by FSIS and FDA laboratories. Some validated methods have been subsequently studied for extension by a single or two analyst intralaboratory or interlaboratory study as follows:

1. Extended to other tissues, species, and products for the initial analyte(s) studied.

2. Extended to other similar analytes for the initial tissues/species and products studied.

C. Federal Register Methods. Methods of analysis published in the Federal Register and later incorporated into the Code of Federal Regulations.

D. Historical Official Methods. Methods that were considered to be the best available at the time of initial acceptance and have continued in use over an extended period in the absence of a more effective method. Included in this category would be pre-1974 NADA methods that were submitted by sponsors and accepted by FDA and FSIS without a multilaboratory study.

E. Nonvalidated Methods (NVM). Methods for quantification and/or confirmation that have not been subjected to a multilaboratory study of at least three independent analysts; or, analytical methods that have been subjected to a multilaboratory study but do not meet either criterion 3 or 5 of the criteria for methods suitable for routine use.

F. Published Methods. These methods have been subjected to a study by a single analyst or laboratory where the data for evaluation are limited. However, a quality control plan will be in place. The results are reviewed by a peer group of government scientists.

G. Correlated Methods. These methods have not been validated by traditional interlaboratory study, but data obtained from use of the method have been correlated and/or compared with data obtained from use of a method for regulatory enforcement. The same samples must be used for this comparison, and the data must be reviewed by a peer group of government scientists.

FSIS RESIDUE ANALYTICAL CAPABILITY

KEY TERMS

AAS	Atomic absorption spectrometry
AOAC	Association of Official Analytical Chemists
CELIA CA	Competitive Enzyme Labeled Immunoassay for Chloramphenicol: a laboratory test that detects and identifies chloramphenicol residues in cattle and pork muscle
EI	Electron impact
E-Z Screen	A proprietary immunoassay system for rapidly detecting and identifying various antibiotics and other residues in tissue extracts
GC	Gas chromatography
GLC	Gas liquid chromatography
HPLC	High pressure liquid chromatography
JAOAC	Journal of the Association of Official Analytical Chemists
J. Food Prot.	Journal of Food Protection
LDL	Lowest detectable limit: the smallest amount of individual residue or sample component that can be reliably observed or found in the sample matrix by the current appropriate methodology
Method Status	See discussion, Section 5.2-5.3.
MIC	Minimum inhibitory concentration: the minimum level of antimicrobial compound present in a buffer extract of tissue that will inhibit bacterial growth.
MPL	Minimum proficiency level: the minimum amount of analyte expected to be identified and quantified by a laboratory and upon which ongoing capability will be evaluated. It is the smallest concentration for which the predicted coefficient for reproducibility (CV) is less than or equal to 20 percent and the upper 90 percent confidence for the predicted CV is less than 30 percent
MS	Mass spectrometry
NADA	New Animal Drug Application, issued by the Food and Drug Administration (FDA)
NE	Level not established

FSIS RESIDUE ANALYTICAL CAPABILITY

Quantification (Quant.)	The determination of the amount of residue present in a sample
Reference Method	Analytical procedures by which other methods may be evaluated and for which performance standards are established. These methods are considered suitable for regulatory use in the National Residue Monitoring Program.
Residue	The presence of remnants of a drug, agricultural or industrial chemical, or trace metal in a food animal
SOS	Sulfa-on-Site: a rapid in-plant chemical screening test for detecting sulfonamide residues in food animal urine or serum that provides same-day results
STOP	Swab Test on Premises: an overnight in-plant microbiological screen test for detecting antibiotic residues in edible tissues
SWAB	STOP precursor: an overnight laboratory microbiological screen test for detecting antibiotic residues in edible tissues
UV	Ultraviolet spectroscopic technique for detection and quantification

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Albendazole	The marker residue is detected and quantified by HPLC-fluorescence detection	20 ppb	50 ppb	II	B	Cattle/liver	Sec. 5.034 FSIS Chemistry Lab Guidebook
	Extracts from HPLC method are confirmed by GC-MS	20 ppb	50 ppb	I	B	Cattle/liver	Sec. 5.034 FSIS Chemistry Lab Guidebook
Aldrin	Micro alumina assay: column chromatography plus GLC	0.02 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.02 ppm	0.10 ppm	II	A	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.02 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.02 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Amoxicillin trihydrate	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.02 ppm	0.02 ppm	II	B	Cattle, swine/ kidney liver muscle	NADA 55-080 & 55-089 Beecham
	Tissue extracts quantified by HPLC using fluorometer	0.01 ppm	0.01 ppm	II	B	Cattle, swine/ kidney liver muscle	NADA 55-080 & 55-089 Beecham
Ampicillin **Ampicillin trihydrate**	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth.	0.01 ppm	0.01 ppm	II	B	Cattle, swine/ all	NADA 55-030 Squibb

[1]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Apramycin	Sample extraction TLC/bioautographed using *Bacillus subtilis* as a test organism	0.05 ppm	0.1 ppm	II	B	Swine/kidney muscle	NADA 106-964
Arsanilate sodium **Arsanilic acid**	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	I	E	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
Arsenate, Calcium **Arsenate, Copper** **Arsenate, Lead** **Arsenate, Magnesium** **Arsenate, Sodium** **Arsenic** **Arsenite, Potassium** **Arsenite, Sodium**	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	II	A	All/kidney liver muscle	AOAC Book of Methods 14th Edit., 25.050
Atrazine	Fat extracts are quantified by capillary GLC with nitrogen/phosphorous detector	5 ppb	NE	II	E	All/fat	Section 5.032 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/MS	5 ppb	NE	II	E	All/fat	Copy available upon request
Bacitracin methylene disalicylate **Bacitracin, zinc**	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.05 ppm	NE	II	D	All/kidney liver muscle	Kramer et. al. FDA 1974

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Bambermycins	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	25 ppb	NE	II	D	All/kidney liver muscle	NADA 44-759 Hoechst
BHC	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.02 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.02 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.02 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Buquinolate	Tissue extracts are screened by fluorescence detection	0.13 ppm	NE	III	E	Cattle/kidney liver muscle	Sec. 5.030 FSIS Chemistry Lab Guidebook
Cacodylic acid	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	I	E	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	II	A	All/kidney liver muscle	AOAC Book of Methods, 14th Edit., 25.050

[1]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Cadmium	Dry ashed tissue is dissolved and quantified by AAS	0.10 ppm	0.30 ppm	I	B	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is quantified by anodic stripping voltammetry	1.0 ppb	NE	I	F	Poultry/ kidney liver	JAOAC,60,4, 826-832 (1977)
Calcium	Tissue is wet ashed and titrated with specific indicator	0.03%	0.03%	II	A	All/muscle	AOAC Book of Methods, 14th Edit., 24.062
	Wet ashed tissue is quantified by AAS	NE	NE	I	E	All	Sec. 6.008 FSIS Chemistry Lab Guidebook
Carbadox	Tissue extract is hydrolyzed and a derivative is prepared and separated by preparative TLC, quantified by GLC	15 ppb	30 ppb	II	B	Swine/ liver muscle	Sec. 5.014 FSIS Chemistry Lab Guidebook
	Extraction followed by ion exchange chromatography, quantified by GLC	15 ppb	NE	II	F	Swine/ liver muscle	Pfizer
Carbarsone	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	I	E	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	II	A	All/kidney liver muscle	AOAC Book of Methods, 14th Edit., 25.050
Carbophenothion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook

[1]Processed product.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Chloramphenicol	Tissue extracts are screened by E-Z screen	5 ppb	NE	III	E	Cattle, swine/ muscle kidney	Environmental Diagnostics
Chloramphenicol palmitate	Tissue extract screened for chloramphenicol by CELIA CA	5 ppb	NE	II	E	Cattle, swine/ muscle	Antimic. Ag. Chemo., 25, 2, 205-211 (1984)
	Tissue extract is derivatized and quantified by GLC with an electron capture detector	10.0 ppb	10.0 ppb	II	B B-1	Cattle/muscle Swine/pp[1]	Sec. 5.022 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by mass spectrometry using negative ion chemical ionization	10.0 ppb	NE	I	B F	Cattle/muscle	Sec. 5.023 FSIS Chemistry Lab Guidebook
Chlordane (technical)	Micro alumina assay: column chromatography plus GLC	0.15 ppm	NE ppm	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.15 ppm	0.30 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.15 ppm	0.30 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.15 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Chlordecone	Organic solvent extraction; Florisil column cleanup with GC quantitation	0.05 ppm	NE	II	E	All/fat liver	JAOAC, 61, 1, 8-14 (1978)
2-Chloro-1,(2,4,5-trichlorophenyl)-vinyl dimethyl phosphate	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	E	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook

[1]Processed product.

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Chlorpyrifos	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Chlortetracycline bisulfate **Chlortetracycline hydrochloride**	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.01 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.01 ppm	NE	II	D	All/kidney liver muscle	Sec. 6.312 FSIS Microbiology Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative and quantified and identified by HPLC	0.01 ppm	NE	II	E	All/kidney liver muscle	Sec. 5.031 FSIS Chemistry Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative for identification by TLC	0.1 ppm	NE	II	E	All/kidney liver muscle	Copy available upon request
Chromium	Dry ashed tissue is extracted with organic reagent and quantified using AAS	NE	NE	I	E	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Clopidol	Organic solvent extraction with HPLC-UV detection	0.1 ppm	NE	II	E	Poultry/liver	JAOAC, 67, 2, 334-336 (1984)
	Organic solvent extraction with GC-EC detection	0.1 ppm	NE	II	A	Poultry/liver	AOAC Book of Methods, 14th Edit., 41.013.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Clorsulon	Tissue extracts are quantified by HPLC-UV detection	0.25 ppm	0.50 ppm	II	B	Red meat/kidney muscle liver pp[1]	NADA 136-762 Merck, Sharp, and Dohme
	Tissue extracts for HPLC are derivatized and confirmed by GC/MS	0.5 ppm	NE	I	B	Red meat/kidney muscle liver pp[1]	NADA 136-762 Merck, Sharp, and Dohme
Cloxacillin, Benzathine	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.16 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
Cloxacillin, Sodium	Microbiological assay combined with HPLC separation and quantified by microbial inhibition	0.02 ppm	NE	II	F	Dairy cows/ kidney liver muscle	NADA 55-069 Beecham-Masengill
Cobalt	Dry ashed tissue is dissolved and quantified using AAS	0.20 ppm	NE	I	B	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Copper	Dry ashed tissue is dissolved and quantified using AAS	0.50 ppm	NE	I	B	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Coumaphos	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	E	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Coumaphos, oxygen analog of	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	E	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Cresylic acid	Tissue extracts are derivatized and determined by GC-EC	NE	NE	III	E	Poultry/fat	Sec. 5.036 FSIS Chemistry Lab Guidebook

[1]Processed product.

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Crufomate	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Cyromazine	Tissue extracts are quantified by HPLC-UV detection	0.05 ppm	0.25 ppm	II	B B-1	All/muscle Red meat/pp[1]	CIBA Geigy AG 417A
DDE (metabolites of DDT collectively reported as DDT)	Micro alumina assay: column chromatography plus GLC	0.02 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.02 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.02 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.02 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
DDT (isomers of DDT collectively reported as DDT)	Micro alumina assay: column chromatography plus GLC	0.04 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.04 ppm	0.15 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.04 ppm	0.15 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook

[1]Processed product.

Compound	Description	TEST METHOD LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Decoquinate	Tissue extracts are screened by fluorescence detection and identified and quantified by GLC	0.13 ppm	0.2 ppm	II	B	Cattle, poultry/ kidney liver muscle	Sec. 5.030 FSIS Chemistry Lab Guidebook
Dibutyltin dilaurate	Tissue extraction followed by acid digestion, quantified by spectrophotometry	0.05 ppm	NE	II	E	Turkey/liver muscle	Anal. Chem. 45, 534-537 (1973)
Dichlorvos	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	A	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Dieldrin	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.01 ppm	0.10	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	F	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.1 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook

[1]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Diethylstilbestrol	Modified Donoho Method: extract is hydrolyzed and derivatized and quantified by GLC	0.50 ppb	2.0 ppb	II	B	Cattle, sheep/ liver muscle	Copy available upon request
	Tissue extract is hydrolyzed, derivative is quantified by GLC, positives are confirmed by mass spectrometry	0.1 ppb	NE	I	E	Cattle, sheep/ kidney liver muscle	Copy available upon request
	Solid state extraction technique followed by HFB derivitization and GLC determination	0.25 ppb	NE	III	E	Cattle/kidney liver muscle	Copy available upon request
	Solid state extraction technique using an internal standard followed by methylsilation for GC/MS quantification and confirmation	0.1 ppb	NE	I	F	Cattle/kidney liver muscle	Copy available upon request
Dihydrostreptomycin	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	II	D	All/kidney liver muscle	Sec. 6.315 FSIS Microbiology Lab Guidebook
Dioxathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Dodecachloro-octahydro-1,3,4-metheno-2H-cyclobuta(cd)-pentalene	Micro alumina assay: column chromatography plus GLC	0.04 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.04 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.04 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
Endrin	Micro alumina assay: column chromatography plus GLC	0.03 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.03 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.03 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.04 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Erythromycin	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	25 ppb	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
Erythromycin phosphate **Erythromycin thiocyanate**	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	25 ppb	NE	II	D	All/kidney liver muscle	Sec. 6.316 FSIS Microbiology Lab Guidebook

[1]Processed product.

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Ethion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Ethion, oxygen analog of	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	E	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Ethylene dibromide	Residue is co-distilled from aqueous suspension and quantified by GLC	0.5 ppb	1.0 ppb	II	B	All/fat	Sec. 5.005 FSIS Chemistry Lab Guidebook
	Mass spectrometry by NICI to determine bromine	1 ppb	NE	I	E	All/fat	Sec. 5.005 FSIS Chemistry Lab Guidebook
Fenbendazole	Liquid-liquid extraction followed by HPLC-UV quant.	0.05 ppm	NE	II	A	Cattle/liver muscle	Hazelton Labs No. 6128-100
	Tissue extracts are quantified by HPLC	200 ppb	200 ppb	II	B	Cattle, calf/ liver	NADA 128-620 American Hoechst
	Quantification extract purified by TLC, derivatized and identified by HPLC fluorescene	200 ppb	NE	II	B	Cattle, calf/ liver	NADA 128-620 American Hoechst
Fenitrothion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Fenthion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	E	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
	Tissue extracts are quantified by GLC with KCl thermionic detector	0.10 ppm	NE	II	E	All/liver muscle	Sec. 5.016 FSIS Chemistry Lab Guidebook
Gentamicin sulfate	Tissue extracts are screened by E-Z Screen	5 ppb	NE	III	E	All/muscle liver kidney	Environmental Diagnostics
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	NE	NE	II	B	Swine/kidney	NADA 103-037 & 91-191 Schering
	Extraction followed by detection by HPLC with fluorescence detector	0.2 ppm	0.4 ppm	I	B	Swine/kidney	NADA 103-037 & 91-191 Schering
Halofuginone	Tissue extracts are quantified by HPLC-UV	0.05 ppm	0.05 ppm	II	B	Chicken/liver muscle	NADA 130-951 American Hoechst Corp.
	Tissue extracts are confirmed by GC/MS/MS	0.05 ppm	NE	I	B	Chicken/liver muscle	NADA 130-951 American Hoechst Corp.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
HCB	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.01 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Heptachlor and heptachlor epoxide	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.01 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook.
Hetacillin, Potassium	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	NE	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831

[1]Processed product.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
5-Hydroxy thiabendazole	Tissue extracts are quantified by HPLC/UV	0.05	NE	II	E	Cattle/liver muscle	Hazelton Labs No. 6128-100
Hygromycin B	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	5.00 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
Ipronidazole and metabolite	Tissue extracts are quantitated by capillary GLC	0.4 ppb	NE	II	E	Turkey, swine/ muscle pp[1]	Sec. 5.012 FSIS Chemistry Lab Guidebook
	Tissue extracts for GLC are confirmed by GC/MS	0.4 ppb	NE	I	E	Turkey,swine/ muscle pp[1]	Sec. 5.013 FSIS Chemistry Lab Guidebook
Iron	Dry ashed tissue is dissolved and quantified by AAS	0.50 ppm	NE	I	B	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce a red complex which is quantified by colorimetry	NE	NE	II	E	All/all	Sec. 6.009 FSIS Chemistry Lab Guidebook
	Wet ashed tissue is quantified by AAS	NE	NE	III	E	All/kidney liver muscle	Sec. 6.008 FSIS Chemistry Lab Guidebook
Ivermectin	Tissue extracts are quantified by HPLC fluorescence	2 ppb	5 ppb	II	B	Red meat/liver muscle[2]	Sec. 5.035 FSIS Chemistry Lab Guidebook
	Derivatization to form 3 components with detection by HPLC fluorescence	2 ppb	NE	I	B	Red meat/liver muscle[2]	Sec. 5.035 FSIS Chemistry Lab Guidebook

[1]Processed product.
[2]To be evaluated for surveillance samples.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Lasalocid	Tissue extracts are quantified by HPLC fluorescence detector	0.025 ppm	0.35 ppm	II	B	Cattle/liver	Sec. 5.029 FSIS Chemistry Lab Guidebook
		0.025 ppm	NE		E	Poultry/fat skin	
	Tissue extraction followed by bioautography	0.005 ppm	0.01 ppm	II	B	Poultry/fat skin	NADA 96-298V Hoffman-LaRoche
	GC pyrolysis of the HPLC extract with MS identification of the fragments	0.2 ppm	NE	I	B	Cattle/liver	NADA 96-298V Hoffman-LaRoche
					E	Poultry/fat skin	
Lead	Dry ashed tissue is dissolved and quantified by AAS	0.03 ppm	0.05 ppm	I	B	All/kidney liver muscle	Sec. 5.022 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is quantified by anodic stripping voltammetry	1.0 ppb	NE	I	E	Poultry/ kidney liver	JAOAC, 60, 4, 826-832 (1977)
Levamisole	Tissue extracts are quantified by GLC	0.05 ppm	0.05 ppm	II	B	Cattle, sheep/ liver	American Cyanamid NADA 126-23
	Tissue extracts are quantified by GLC flame photometric detection	0.05 ppm	NE	II	E	Red meat/ liver muscle	Sec. 5.033 FSIS Chemistry Lab Guidebook
	Tissue extracts are subjected to GC/MS	0.05 ppm	NE	I[1]	E	Red meat/ liver muscle	Copy available upon request
Lincomycin hydrochloride	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.10 ppm	0.10 ppm	II	C	Poultry, swine/all	NADA 97-505 Upjohn

[1]Applies only when used in combination with FSIS Chemistry Lab Guidebook Section 5.033 method.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Lindane	Micro alumina assay: column chromatography plus GLC	0.01 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.01 ppm	0.10 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.01 ppm	0.10 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.01 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Lysergic acid diethylamide	Tissue extracts are spotted for TLC and detected with specific chromagenic reagent	NE	NE	I[2]	E	All/kidney liver muscle pp[1]	Sec. 5.028 FSIS Chemistry Lab Guidebook
Malathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Manganese	Dry ashed tissue is dissolved and quantified by AAS	0.05 ppm	NE	I	E	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Mebendazole	Tissue extracts are quantified by HPLC with UV detector	0.05 ppm	NE	II	E	Cattle/liver muscle	Hazelton Labs No. 6128-100
Melengestrol acetate	Tissue extract is column chromatographed on Florisil and quantified by GLC	5.0 ppb	10.0 ppb	II	A	Cattle/muscle kidney liver fat	AOAC Book of Methods, 14th Edit., 41.029

[1]Processed product.
[2]Applies only to compound identification.

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Mercury	Tissue is digested in acid. Mercury is reduced to its vapor and quantified by flameless AAS	0.01 ppm	0.02 ppm	I	B	All/kidney liver muscle	Sec. 5.007 FSIS Chemistry Lab Guidebook
Methanearsonic acid	Dry ashed tissue is dissolved and reacted to produce arsine gas which is quantified by AAS	0.05 ppm	NE	I	E	All/kidney liver muscle	Sec. 5.090 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	II	A	All/kidney liver muscle	AOAC Book of Methods, 14th Edit., 25.050
Methoxychlor	Micro alumina assay: column chromatography plus GLC	0.15 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.15 ppm	0.50 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.15 ppm	0.50 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.15 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Methyl parathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phopshorous flame ionization detector	0.10 ppm	NE	II	B	All/liver muscle	Sec 5.006 FSIS Chemistry Lab Guidebook

[1]Processed product.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Monensin	Tissue extract is partitioned by TLC and semi-quantified by inhibition of microorganism growth	0.05 ppm	0.10 ppm	II	B	Cattle, poultry/ liver fat	NADA 38-878V Eli Lilly
Morantel tartrate	Tissue extract is hydrolyzed and a derivative is quantified by GLC	0.25 ppm	0.50 ppm	II	B	Cattle/liver	NADA 92-444 NADA 93-903 Pfizer
		0.50 ppm	NE	II	E	Cattle/muscle	
	Identification of a structurally significant hydrolyzed fragment by GC/MS	0.25 ppm	NE	I	B	Cattle/liver muscle	NADA 92-444 NADA 93-903 Pfizer
Narasin	Tissue extracts are spotted on TLC and quantified with a bioautographic overlay	5 ppb	NE	II	B	Cattle, poultry/ liver kidney fat	NADA 118-980 Elanco
Neomycin sulfate	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth.	0.25 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Tissue extracts are screened by E-Z Screen	10 ppb	NE	III	E	All/muscle liver kidney	Environmental Diagnostics
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	II	D	All/kidney liver muscle	Sec. 6.317 FSIS Microbiology Lab Guidebook
Nequinate	Tissue extracts are screened by fluorescence detection	0.13 ppm	NE	II	E	Cattle/kidney liver muscle	Sec. 5.030 FSIS Chemistry Lab Guidebook

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Nickel	Dry ashed tissue is dissolved and quantified by AAS	0.20 ppm	NE	I	B	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook
Nonachlor	Micro alumina assay: column chromatography plus GLC	0.05 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.05 ppm	0.15 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.037
	Mills method: Florisil column chromatography plus GLC	0.05 ppm	0.15 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.05 ppm	NE	I	E	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Novobiocin	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.125 ppm	NE	II	D	All/kidney liver muscle	Kramer et. al. FDA 1974
Oleandomycin	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth.	0.25 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
Oxfendazole	Tissue extracts are quantified by HPLC with UV detector	0.05 ppm	NE	II	E	Cattle/liver muscle	Hazelton Labs No. 6128-100

[1]Processed product.

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Oxytetracycline hydrochloride	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth.	0.08 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth.	0.08 ppm	0.08 ppm	II	D	All/kidney liver muscle	Sec. 6.312 FSIS Microbiology Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative and identified and quantified by HPLC	0.01 ppm	NE	II	E	All/kidney liver muscle	Sec. 5.031 FSIS Chemistry Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative for identification by TLC	0.1 ppm	NE	II	E	All/kidney liver muscle	Copy available upon request
Parathion	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
PBB	Micro alumina assay: column chromatography plus GLC detection by electron capture. UV degradation of PBB's is used as confirmation	0.05 ppm	NE	II	E	All/fat	Ralston-Purina Method MP-PBB.36 9/12/79
PCB's (reported as Arachlor 1242, 1248, 1254, 1260, etc.)	Micro alumina assay: column chromatography plus GLC	0.30 ppm	NE	II	E	All/fat/pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.30 ppm	0.50 ppm	II	A-2-b	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	AOAC Method: solvent extraction combined with column chromatography plus GLC with electron capture detection	0.30 ppm	0.50 ppm	I	A A-1	Poultry/fat All other/fat pp[1]	AOAC Book of Methods, 14th Edit., 29.001

[1]Processed product.

FSIS RESIDUE ANALYTICAL CAPABILITY

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Penicillin, procaine and procaine G	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	12.5 ppb	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
Penicillin G (benzathine, free acid, sodium salt, and procaine salts)	Microbiological assay procedure: the ability of tissue extracts containing microbial growth	12.5 ppb	NE	II	D	All/kidney liver muscle	Sec. 6.311 FSIS Microbiology Lab Guidebook
Pentachlorophenol	Tissue digestate is extracted with cyclohexane and quantified by GLC	0.03 ppm	0.05 ppm	II	B	All/liver muscle	Sec. 5.024 FSIS Chemistry Lab Guidebook
	Tissue extracts for GLC are confirmed by GC/MS	0.03 ppm	NE	I	E	All/liver muscle	Sec. 5.025 FSIS Chemistry Lab Guidebook
Phencyclidine	Tissue extracts are spotted for TLC with specific chromagenic reagent	NE	NE	III	E	All/liver muscle	Sec. 5.028 FSIS Chemistry Lab Guidebook
Propazine	Fat extracts are quantified by capillary GLC with nitrogen-phosphorous detector	5 ppb	10 ppb	II	E	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/MS	5 ppb	NE	II	E	All/fat	Copy available upon request.
Pyrantel tartrate	Tissue extract is hydrolyzed and a derivative is quantified by GLC	0.25 ppm	0.50 ppm	II	B	Swine/liver muscle	NADA 43-290
	Identification by a structurally significant hydrolyzed fragment by GC/MS	0.25 ppm	NE	I	E	Swine/liver muscle	JAOAC, 65, 3 640-646 (1982)

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Robenidine hydrochloride	Tissue extracts are quantified by differential pulse polarography	0.1 ppm	NE	II	B	Chicken/fat muscle liver skin	Sec. 5.017 FSIS Chemistry Lab Guidebook
Ronnel	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	B	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Roxarsone	Dry ashed tissue is dissolved and reacted to produce arsine gas, which is quantified by AAS	0.05 ppm	NE	I	E	All/kidney liver muscle	Sec. 5.009 FSIS Chemistry Lab Guidebook
	Dry ashed tissue is dissolved and reacted to produce arsine gas, which reacts to form blue complex for colorimetric quantification	0.05 ppm	0.20 ppm	II	A	All/kidney liver muscle	AOAC Book of Methods, 14th Edit., 25.050
Selenium	Tissue is digested in acid and quantified by graphite furnace AAS	0.02 ppm	NE	I	E	All/kidney liver muscle	Copy available upon request
Simazine	Fat extracts are quantified by capillary GLC with nitrogen-phosphorous detector	5 ppb	NE	II	E	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/MS	5 ppb	NE	II	E	All/fat	Copy available upon request
Spectinomycin hydrochloride	Microbiological assay: tissue extracts are quantified using a turbidimetric assay	2.8 ppm	NE	III	E	All/kidney liver muscle	NADA 47-244 Upjohn

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Streptomycin	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.25 ppm	NE	II	D	All/kidney liver muscle	Sec. 6.315 FSIS Microbiology Lab Guidebook
Styrene	Tissues are subjected to GC/MS headspace analysis	1 ppb	NE	I[1]	F	All/kidney liver muscle fat pp[2]	Sec. 5.026 FSIS Chemistry Lab Guidebook
Sulfabromo-methazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A-2-b	Red meat/ liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfachloro-pyridazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A-2-b	Red meat/ liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfadimethoxine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A	All/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
	Extraction followed by GC/EI mass spectrometry	0.05 ppm	NE	I	B	All/liver muscle	Sec. 5.013 FSIS Chemistry Lab Guidebook
Sulfaethoxy-pyridazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A-2-b	Red meat/ liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook

[1]Method is semi-quantitative.
[2]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Sulfamethazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A	All/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
					A-2-a	Red meat/pp[1]	
	Tissue extracts are confirmed by GC/EI mass spectometry	0.05 ppm	NE	I	B	All/liver muscle	Sec. 5.013 FSIS Chemistry Lab Guidebook
					E	All/pp[1]	
	Tissue extracts are detected by TLC fluorescence (SOS-urine)	NE	NE	III	G	Swine/urine	Copy available upon request
Sulfamethoxy-pyridazine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A-2-b	Red meat/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfapyridine	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A-2-b	All/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
Sulfaquinoxaline	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A	Poultry/liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/EI mass spectrometry	0.05 ppm	NE	I	B	Poultry/liver muscle	Sec. 5.013 FSIS Chemistry Lab Guidebook
Sulfathiazole	TLC fluorescence: tissue extracts are partitioned by TLC and quantified by densitometry	0.02 ppm	0.05 ppm	II	A-1	Red meat/ liver muscle	Sec. 5.018 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/EI mass spectrometry	0.05 ppm	NE	I	B	Red meat/ liver muscle	Sec. 5.013 FSIS Chemistry Lab Guidebook

[1]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
TDE (metabolite of DDT reported collectively as DDT)	Micro alumina assay: column chromatography plus GLC	0.04 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.02 ppm	0.05 ppm	II	A	All/fat	AOAC Book of Methods, 14th Edit., 29.029
	Mills method: Florisil column chromatography plus GLC	0.04 ppm	0.15 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
	Extracts from GPC or Mills are confirmed by GC/MS	0.02 ppm	NE	I	E (GPC/MS) F (Mills/MS)	All/fat pp[1]	Sec. 5.004 FSIS Chemistry Lab Guidebook
Terbuthylazine	Fat extracts are quantified by capillary GLC with nitrogen-phosphorous detector	5 ppb	NE	II	E	All/fat	Sec. 5.032 FSIS Chemistry Lab Guidebook
	Tissue extracts are confirmed by GC/MS	5 ppb	NE	II	E	All/fat	Copy available upon request
Terpene polychlorinates	Micro alumina assay: column chromatography plus GLC	0.50 ppm	NE	II	E	All/fat	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.50 ppm	NE	II	E	All/fat	Sec. 5.001 FSIS Chemistry Lab Guidebook

[1]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Tetracycline hydrochloride	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.08 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.08 ppm	NE	II	D	All/kidney liver muscle	Sec. 6.312 FSIS Microbiology Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative for identification and quantification by HPLC	0.01 ppm	NE	II	E	All/kidney liver muscle	Sec. 5.031 FSIS Chemistry Lab Guidebook
	Tissue extraction of parent drug is converted to anhydro derivative for identification by TLC	0.1 ppm	NE	II	E	All/kidney liver muscle	Copy available upon request
Thiabendazole	Tissue extracts are quantified by HPLC with UV detector	0.05 ppm	NE	II	E	Cattle/liver muscle	Copy available upon request
Thiram	Tissue extracts are quantified by HPLC with UV detector	0.1 ppm	NE	II	E	Cattle, swine/ muscle	Copy available upon request
Tiamulin	Organic solvent extraction followed by GC of the 8 hydroxymutilin metabolite	0.2 ppm	0.4 ppm	II	B	Swine/liver	INAD 1776 Diamond-Shamrock Corp
	Extracts confirmed by GC/MS	NE	0.4 ppm	I	B	Swine/liver	INAD 1776 Diamond-Shamrock Corp
Tin	Tissue is dry ashed and dissolved and quantified by AAS	NE	NE	I	E	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook

Compound	TEST METHOD Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Toxaphene	Micro alumina assay: column chromatography plus GLC	0.50 ppm	NE	II	E	All/fat pp[1]	Sec. 5.002 FSIS Chemistry Lab Guidebook
	Gel permeation chromatography (GPC) plus GLC	0.50 ppm	NE	II	E	All/fat	Sec. 5.003 FSIS Chemistry Lab Guidebook
	Mills method: Florisil column chromatography plus GLC	0.50 ppm	1.00 ppm	II	B	All/fat pp[1]	Sec. 5.001 FSIS Chemistry Lab Guidebook
Trichlorfon	Tissue extracts are quantified by GLC with flame photometric or nitrogen-phosphorous flame ionization detector	NE	NE	II	E	All/liver muscle	Sec. 5.006 FSIS Chemistry Lab Guidebook
Tylosin	Antibiotic screen test (SWAB): the ability of tissue fluids containing antimicrobial activity to inhibit microbial growth	0.20 ppm	NE	III	E	All/kidney	J. Food Prot., 1981, 44, 828-831
	Tissue extracts are screened by E-Z screen	5 ppb	NE	III	E	All/muscle liver kidney	Environmental Diagnostics
	Liquid-liquid extraction followed by HPLC-UV detection	0.1 ppm	NE	II	E	Cattle/muscle	Copy available upon request
Virginiamycin	Microbiological assay procedure: the ability of tissue extracts containing antimicrobial activity to inhibit microbial growth	0.64 ppm	NE	II	E	Swine/ kidney liver muscle	NADA 91-467 & 91-513 Smith Kline & French

[1]Processed product.

Compound	TEST METHOD						
	Description	LDL/ MIC	MPL	Level	Status	Species/ Tissues	Reference
Zeranol	Extraction followed by radioimmunoassay	1.0 ppb	NE	III	E	All/liver muscle	Copy available upon request
	Solid state extraction using an internal standard followed by polymethylsilation for GC/MS quantification and confirmation	0.25 ppb	NE	I	F	All/liver muscle	Copy available upon request
Zinc	Tissue is dry ashed and dissolved and quantified by AAS	NE	NE	I	B	All/kidney liver muscle	Sec. 5.010 FSIS Chemistry Lab Guidebook

Section 6

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Aflatoxin[1]					X	X		X		
Albendazole								X	X	
Aldrin	X	X	X	X	X	X	X	X	X	X
Amoxicillin trihydrate	X	X	X	X	X	X	X	X	X	X
Ampicillin	X	X	X	X	X	X	X	X	X	X
Ampicillin trihydrate	X	X	X	X	X	X	X	X	X	X
Apramycin							X	X	X	
Arsanilate sodium	X	X	X	X	X	X	X	X	X	X
Arsanilic acid	X	X	X	X	X	X	X	X	X	X
Arsenate, Calcium	X	X	X	X	X	X	X	X	X	X
Arsenate, Copper	X	X	X	X	X	X	X	X	X	X
Arsenate, Lead	X	X	X	X	X	X	X	X	X	X
Arsenate, Magnesium	X	X	X	X	X	X	X	X	X	X
Arsenate, Sodium	X	X	X	X	X	X	X	X	X	X
Arsenic	X	X	X	X	X	X	X	X	X	X
Atrazine							X	X	X	
BHC	X	X	X	X	X	X	X	X	X	X
Cacodylic Acid	X	X	X	X	X	X	X	X	X	X
Cadmium	X	X		X			X	X	X	X

[1]Analysis done by contractor.

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Carbadox	X	X	X	X	X	X	X	X	X	
Carbarsone	X	X	X	X	X	X	X	X	X	X
Chloramphenicol					X	X	X	X	X	X
Chloramphenicol palmitate					X	X	X	X	X	X
Chlordane (technical)	X	X	X	X	X	X	X	X	X	X
2-Chloro-1,(2,4,5-trichloro-phenyl)vinyl dimethyl phosphate	X	X	X					X	X	X
Chlorpyrifos		X		X	X	X	X	X	X	X
Chlortetracycline bisulfate	X	X	X	X	X	X	X	X	X	X
Chlortetracycline hydrochloride	X	X	X	X	X	X	X	X	X	X
Clopidol	X	X	X							X
Clorsulon										X
Cloxacillin, Benzathine	X	X	X	X	X	X	X	X	X	X
Cloxacillin, Sodium	X	X	X	X	X	X	X	X	X	X
Cobalt		X		X			X	X	X	X
Copper	X	X		X			X	X	X	X
Coumpahos and oxygen analog		X		X	X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Crufomate		X		X	X	X	X	X	X	X
Cyromazine								X	X	X
DDE (metabolite of DDT)	X	X	X	X	X	X	X	X	X	X
DDT	X	X	X	X	X	X	X	X	X	X
Decoquinate							X	X		X
Dibutyltin dilaurate						X				
Dichlorvos		X		X	X	X	X	X	X	X
Dieldrin	X	X	X	X	X	X	X	X	X	X
O,O-Diethyl S-(2-(ethylthio)-ethyl) phosphorodithioate		X		X	X	X	X	X	X	X
O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl phosphorothioate		X		X	X	X	X	X	X	X
Diethylstilbestrol	X	X	X	X	X	X	X	X	X	X
Dihydrostreptomycin	X	X	X	X	X	X	X	X	X	X
Dimetridazole[1]		X	X							
Dioxathion		X		X	X			X	X	X
Dodecachlorooctahydro-1,3,4-metheno-2H-cyclobuta (cd)pentalene	X	X	X	X	X	X	X	X	X	X

[1]Method used was best available at the time; since made obsolete by scientific advancement.

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Endrin	X	X	X	X	X	X	X	X	X	X
Erythromycin	X	X	X	X	X	X	X	X	X	X
Erythromycin phosphate	X	X	X	X	X	X	X	X	X	X
Erythromycin thiocyanate	X	X	X	X	X	X	X	X	X	X
Ethion and oxygen analog		X		X	X	X	X	X	X	X
Ethylene dibromide							X	X	X	
Fenbendazole								X	X	X
Fenitrothion		X		X	X	X	X	X	X	X
Fenthion		X		X	X	X	X	X	X	X
Gentamicin sulfate								X	X	X
Halofuginone										X
HCB	X	X	X	X	X	X	X	X	X	X
Heptachlor and heptachlor epoxide	X	X	X	X	X	X	X	X	X	X
Hetacillin, Potassium	X	X	X	X	X	X	X	X	X	X
Ipronidazole	X[1]	X[1]						X	X	X
Ipronidazole hydrochloride	X[1]	X[1]						X	X	X
Iron								X	X	X
Ivermectin								X	X	X

[1]Method used was best available at the time; since made obsolete by scientific advancement.

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Lasalocid							X	X	X	
Lead	X	X		X				X	X	X
Levamisole hydrochloride		X[1]	X[1]					X	X	X
Levamisole phosphate		X[1]	X[1]					X	X	X
Lindane	X	X	X	X	X	X	X	X	X	X
Malathion		X		X	X	X	X	X	X	X
Manganese		X		X			X	X	X	X
Mebendazole										X
Melengestrol acetate		X	X	X	X	X	X			
Mercury	X			X				X		X
Methanearsonic acid	X	X	X	X	X	X	X	X	X	X
Methoxychlor	X	X	X	X	X	X	X	X	X	X
Methyl parathion		X		X	X	X	X	X	X	X
Monensin	X	X		X	X	X	X	X	X	
Morantel tartrate							X	X	X	
Neomycin sulfate	X	X	X	X	X	X	X	X	X	X
Nickel		X		X			X	X	X	X
Nonachlor	X	X	X	X	X	X	X	X	X	X

[1]Method used was best available at the time; since made obsolete by scientific advancement.

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Novobiocin									X	X
Oxfendazole										X
Oxytetracycline hydrochloride	X	X	X	X	X	X	X	X	X	X
Parathion		X		X	X	X	X	X	X	X
PBB						X	X			
PCB	X	X	X	X	X	X	X	X	X	X
Penicillin, procaine and procaine G	X	X	X	X	X	X	X	X	X	X
Penicillin G (benzathine, free acid, sodium salt and procaine salts)	X	X	X	X	X	X	X	X	X	X
Pentachlorophenol		X			X	X	X	X	X	X
Potassium arsenite	X	X	X	X	X	X	X	X	X	X
Propazine							X	X	X	
Pyrantel tartrate							X	X	X	
Robenidine hydrochloride	X	X								
Ronnel		X		X	X	X	X	X	X	X
Roxarsone	X	X	X	X	X	X	X	X	X	X
Simazine							X	X	X	

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Selenium		X						X		
Sodium arsenite	X	X	X	X	X	X	X	X	X	X
Streptomycin	X	X	X	X	X	X	X	X	X	X
Sulfabromomethazine sodium	X	X	X	X	X	X	X	X	X	X
Sulfachloropyridazine								X	X	X
Sulfadimethoxine	X	X	X	X	X	X	X	X	X	X
Sulfaethoxypyridazine								X	X	X
Sulfamethazine	X	X	X	X	X	X	X	X	X	X
Sulfamethoxypyridazine								X	X	X
Sulfapyridine	X	X	X	X	X	X	X	X	X	X
Sulfaquinoxaline	X	X	X	X	X	X	X	X	X	X
Sulfathiazole	X	X	X	X	X	X	X	X	X	X
TDE (metabolite of DDT)	X	X	X	X	X	X	X	X	X	X
TDE (or DDD)	X	X	X	X	X	X	X	X	X	X
Terbuthylazine							X	X	X	
Terpene polychlorinates	X	X	X	X	X	X	X	X	X	X
Tetracycline hydrochloride	X	X	X	X	X	X	X	X	X	X

NATIONAL RESIDUE PROGRAM—COMPOUNDS INCLUDED

Compounds/Years	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Thiabendazole	X[1]	X[1]							X	X
Tin						X	X	X		
Toxaphene	X	X	X	X	X	X	X	X	X	X
Trichlorfon		X		X			X	X	X	X
Tylosin								X	X	X
Virginiamycin									X	X
Zearalenone[1]	X									
Zeranol									X	X
Zinc	X	X		X			X	X	X	X

[1]Method used was best available at the time; since made obsolete by scientific advancement.

Section 7

NATIONAL RESIDUE PROGRAM PLAN—INTRODUCTION

The development of the National Residue Program Annual Plan begins in February of the preceding year and progresses by means of discussions, both formal and informal, among the Residue Evaluation and Planning Division of the Science Program (FSIS), other Science divisions, and involved Federal agencies; it culminates in formal reviews by FSIS and an interagency working group during the late summer and fall.

In 1983 FSIS asked the Food and Nutrition Board of the National Research Council (NRC) to evaluate the scientific basis of the present system for inspecting meat and poultry and meat and poultry products; an assessment of the National Residue Program was included in the request. The NRC report, "Meat and Poultry Inspection: The Scientific Basis of the Nation's Program," was published on July 16, 1985. It contained a number of recommendations and described the characteristics of an ideal program. During fiscal year 1986, FSIS considered the mission and design of the residue program in terms of the NRC report. This review influenced portions of the 1986 plan and has had an additional impact on the 1987 plan.

Although the projections upon which the plan is based are as exact as possible, they may not match budgetary or facility resources or specific sampling and analytical capabilities or requirements during 1987. Residue control is a dynamic field, with continual change; the plan will be modified during the year as additional information alters the original assessment.

The Introduction describes the tables in which the details of the plan are presented. Preceding the tables is an alphabetical list (with explanatory material) of the compounds included in the 1987 plan.

Table I

Table I lists the compounds included in the 1987 plan, the ranking assigned, and the residue designation used in the plan. The residue designation identifies the class of compounds detected by the initial analytical procedure. For example, "arsenic" includes several arsenical compounds.

The Analytical Capability section of this document lists the analytical methods used, the minimal levels of measurement that can be achieved, and references to full descriptions of the methods. FSIS maintains a laboratory development and quality-assurance program to ensure progress in residue testing and the integrity of its test results. Before an analyst is allowed to conduct a test on a monitoring or surveillance sample, he or she must demonstrate adequate proficiency and meet specified standards in analyzing quality-assurance samples. (Additional information on the quality-assurance program can be obtained from the FSIS Quality Assurance Handbook.)

Whenever possible, multiple-residue methods are used to detect the presence of more than one residue in a sample; such procedures are

used for chlorinated hydrocarbons, antibiotics, sulfonamides, and other classes of compounds. Some of the multiple-residue methods detect the presence of additional compounds not included in this listing; however, the confirmation of identity of precise quantification of these additional residues may or may not be possible. Some compounds that are not significant public health concerns may be included because they are detected in multi-residue testing procedures. The multi-residue methods and the number of compounds that may be identified by each method are expanded when new or modified technology is available.

Table II

The plan is based on a "residue/species pair" design concept. The species or production-class groups used in residue/species couplings are determined by commonalities in rearing, as these factors affect the animal's exposure and the probability that residues may be present at slaughter. For example, market hogs have an exposure-potential profile different from that of boars and sows.

Table II lists the species or production-class groups normally used for a residue/species pair in a statistical design, the apportionment of samples between production classes, and the minimal number of samples usually planned for evaluating the data set. Exceptions to the groupings for particular compounds are made when appropriate.

Table III

Although the monitoring program is not designed to provide statistical estimates of the percentage of violations in large populations, such estimates are available as auxiliary information provided a high, or otherwise specified, degree of precision is not necessary. Table III depicts the relationship between the sample size and the precision of the estimates of the percentage of violations in large populations. For example, if no violations are found in a set of 300 analyses, there is 95 percent confidence that the frequency of violations in the population is not larger than 1.0 percent. If one violation is found, there is a 5 percent chance that the percentage of violations in the population is more than 1.8 percent or less than 0.01 percent. Providing assurance that the frequency of violations was not more than 0.1 percent, with 95 percent confidence, would require 3,000 samples. Such enormous data sets would cost a great deal and would provide little additional information or public health protection. A much more effective procedure is to control the exposure of the animals to contamination.

When it is known or anticipated that a residue presents a significant problem, sampling may be increased. The increased sampling permits study of trends and geographic or seasonal variation in violation rates, and may aid in preparing effective control actions.

Collection requests for samples are generated using a computerized system in Washington, D.C. Sample and plant selection is random and statistically (probability) based, with a minimal bias. Normally, residues are monitored for the entire year, but some may be introduced during

the year and may continue into the following year. Others may be included only during a particular period of the year. Variables such as production volume, geography, and season are addressed statistically within resource constraints. In some cases where method development is incomplete, samples will be collected on a monthly basis but analytical work may be delayed until the methods are implemented.

Table IV Table IV lists the tissues to be collected for domestic sample analysis.

Table V Table V presents a summary of the combined domestic and import plans. The plans specify the minimum sample units planned for analysis. In the domestic program a sample unit refers to a set of one or more tissues collected for analysis from either one head of livestock or six head of poultry where samples of a tissue type (e.g., liver) from the birds are composited and a representative sample is analyzed. The number of tissues composing a sample unit depends upon the residue, as shown in Table IV.

Table VI In themselves, sample numbers are not good indicators of the actual commitment of resources, or of the effectiveness of these commitments. Table VI illustrates the wide divergence among test procedures in amount of analyst time required per sample.

Table VII Table VII presents the domestic program sample units planned for 1987, including monitoring, surveillance, and exploratory activities.

Tables VIII-IX Tables VIII and IX show the monitoring and exploratory sample units planned for domestic livestock and poultry, respectively. The sample unit numbers for each residue designation are dispersed according to species.

Table X Table X presents the sample plan for imported products.

The design of the import plan differs from the domestic plan because it involves the reinspection of product that has already been inspected under an approved foreign system with a residue program equal to that of the U.S. Thus port-of-entry residue sampling is intended to provide further information on the operation of the foreign system's residue controls.

The import inspection program uses an Automated Import Information System (AIIS) to direct the selection of samples from any port where product may arrive. Data stored in the AIIS are used for monthly updates of the sampling requirements for each country, product, and residue class, to assure that the commitments of the annual plan are met. Appropriate changes can be made in the AIIS if, during the course of the year, there are unexpected changes in the volume or type of imported product from any country or countries.

Tables XI-XII

Table XI shows the planned import samples by species and Table XII shows estimated analyses per country.

Table XIII

Table XIII shows how the sampling rates are determined. Volume of products exported to the U.S. is factored into a formula to yield a "starting point" number. This number is modified according to a compound's evaluation and ranking, and FSIS laboratory capabilities.

Tables XIV-XXII

Table XIV shows the estimated annual volume of imported beef, divided into fresh (including frozen) and processed products, and the estimated sampling rates for each class of product. Table XV lists the monitoring and exploratory sample unit analyses planned for fresh and processed beef products. Tables XVI and XVII follow the same procedure for imported pork; Tables XVIII and XIX for fresh veal, mutton, and lamb; and Tables XX, XXI, and XXII for ducks/geese, turkeys, and chickens.

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Albendazole

Albendazole is a broad-spectrum anthelminitc temporarily authorized by FDA for emergency use against liver flukes (fascioliasis) in cattle and sheep in 18 states and Guam; this authorization was withdrawn in 1985. Albendazole is a teratogen and immunosuppressant in some species.

Albendazole is effective not only against flukes but also against lung and intestinal helminths; for this reason, albendazole analysis will be performed in 1987 on samples from cattle, sheep, and goats, to provide assurance that albendazole is not being used. Sample collection will be nationwide, as major lung and intestinal helminthic disease occurs in areas that are not necessarily afflicted with fascioliasis.

Albendazole is available in foreign countries. Since the analytical method for albendazole has been validated for beef liver and is being extended to beef muscle and to sheep and lamb muscle, analysis of beef and sheep muscle tissue for albendazole is included in the import sampling program for 1987. (Note asterisks in pertinent tables.)

Antibiotics

Agricultural use of antibiotics to control disease processes is ubiquitous. During the last decade antibiotic use in food animals, as in human medicine, has been increasingly directed against specific conditions and less toward general therapy or disease prevention. However, antibiotics are still fed at subtherapeutic levels to enhance feed efficiency and promote growth.

The antibiotics vary widely in their toxicity, safe residue levels, and withdrawal periods required. Toxic effects include, for example, life-threatening hypersensitivity responses (penicillin) and hearing impairment (streptomycins). In addition, there is concern about the development and transmission of pathogenic organisms resistant to antibiotic therapy.

The screening test for antibiotics used in the 1987 National Residue Monitoring program will identify penicillins, streptomycins, tetracyclines, bacitracin, neomycin, erythromycin, gentamicin, and tylosin. Another screening test, for lincomycin, novobiocin, and virginiamycin, was used during 1986 and indicated that there was no apparent problem with these antibiotics.

The 1987 domestic plan contains sampling for antibiotics in all species/production groups. Included in the domestic activities are area monitoring samples in Puerto Rico, in fulfillment of a commitment to Puerto Rican authorities to increase monitoring (50 bulls and cows, 25 market hogs, 25 boars and sows, and 50 young chickens).

Calves have presented the highest percentage of violative antibiotic residues (principally streptomycin and neomycin). Previously, all classes of calves have been grouped together for monitoring. In 1987

calves will be divided into three groups: bob veal (up to 3 weeks of age or 150 pounds in weight), fancy veal (formula- and non-formula-fed calves between 150 and 400 pounds), and other calves (above 400 pounds). For national monitoring, each class of calves will be sampled separately (300 analyses per class). The existing data base does not allow for this division but is being upgraded so that it will be possible.

Bob veal calves present an especially acute problem, as they are slaughtered before any administered drugs can deplete to safe levels. In response to this problem, FSIS conducts an intensive in-plant testing program—the Calf Antibiotic and Sulfonamide Test (CAST) program—for the occurrence of violative antibiotic and sulfonamide residues in bob calves.

Violative residues could also occur in calves that have been treated with aminoglycosides for respiratory disease common at 3-4 weeks of age, as these drugs are retained in the kidney well after treatment. Thus special surveillance programs of three months duration will be conducted to determine if there is misuse of antibiotics in fancy veal calves.

Cows also tend to have violative residues. Cows presented for slaughter are usually culled from beef or dairy herds for substandard performance and may have been treated before slaughter. FSIS has an active in-plant testing program—the Swab Test on Premises (STOP) program—for cows suspected of containing violative residues, that has been effective over the years in reducing the previously very high violation rate in this vulnerable group of animals. Since cows are often presented for slaughter singly or in small lots, it has proved difficult to trace violative carcasses found in monitoring to their place of origin for follow-up surveillance testing. In 1987, all cows sampled under the national monitoring program will be concurrently screened by the STOP test. Carcasses that are STOP-positive will be retained pending confirmation of adulteration by laboratory analysis. Also, the use of STOP procedures at establishments slaughtering significant numbers of cows will be reviewed. Data from this review may be used to develop special surveillance projects in 1987.

The problem of antibiotic contamination may occur in culled mature animals of other species as well. Special surveillance projects will also be conducted in 1987 for mature sows, ewes, chickens, and turkeys. Three hundred samples will be collected for each of these classes from plants with a moderate slaughter volume (1,000 to 30,000 head annually) and a high condemnation rate.

During 1987 the rate of monitoring for horses will be increased from 100 to 300 samples per year. In addition, all sampled horses are to be screened in-plant by the STOP test; if the horse is STOP-positive, the carcass will be retained pending confirmation of adulteration by laboratory analysis. This new approach to monitoring samples collected from horses will provide the first economic incentive to

assure that horses presented for slaughter are not adulterated with antibioitic residues. Additional surveillance sampling may be added to a particular plant that has a greater incidence of adulterated animals.

While the 1987 plan shows increased testing for antibiotics through projects directed toward known or suspected problem areas, the number of monitoring samples to be collected from broilers (young chickens) and ducks will be reduced from 300 to 100 per year because there have been no antibiotic violations in these slaughter classes for at least two years.

Imported beef, pork, veal, mutton, and lamb will be sampled and tested for antibiotics in 1987.

Arsenic

Compounds containing arsenic are monitored by a method that measures total arsenic (Table I). Arsenic is an element and thus occurs naturally in several molecular forms and in various concentrations in the earth's crust.

Organic arsenical compounds, either alone or combined with other compounds, have been widely used both in humans and in food-producing animals as tonics, restoratives, nutrients, herbicides, pesticides, antiprotozoal and anthelmintic agents, antimicrobials, and growth promoters. They are approved for use in chickens as coccidiostats and growth promoters and in swine as growth promoters and for bacterial enteritis. Arsenical preparations are widely used by horsemen for a variety of conditions. Both in chickens and swine (and in humans), arsenical compounds have generally been replaced by compounds that are less expensive and more efficient and specific. When arsenicals are used as approved in chicken and swine, the animals and birds must not be treated with or exposed to the arsenical compounds within five days of slaughter. This five-day withdrawal period is sufficient to ensure that concentrations of arsenic in the tissues are lower than the tolerance concentrations.

There is information linking inorganic arsenicals to skin, lung, and liver cancer. However, information on the classes of organic arsenical compounds being used in food animal production indicates that these compounds do not have carcinogenic or irritant effects.

Arsenic is included in the domestic monitoring plan for horses, market hogs, and young chickens and turkeys. In imports it will be monitored in pork, fresh turkeys and cooked turkey products, and fresh chickens and processed chicken products.

Benzimidazoles

The benzimidazoles detected by FSIS's current laboratory procedures are mebendazole, fenbendazole, oxfendazole, and thiabendazole and its 5-hydroxy metabolite. These anthelmintics have various approvals for use in cattle, horses, swine, poultry, goats, or sheep, for treatment of gastrointestinal or lung worms.

Undesirable side effects frequently encountered in human beings treated with benzimidazoles are anorexia, nausea, vomiting, and dizziness. Less frequently noted are diarrhea, epigastric distress, drowsiness, and headache.

During 1986, a method became available for screening samples from cattle for the group of benzimidazoles noted above. During 1987 the method will be extended to sheep, lambs, and market hogs (note asterisks in pertinent tables). Imported beef, pork, mutton, and lamb will also be sampled and tested for benzimidazoles. In all, the benzimidazole screening analysis will be conducted on 2,100 samples.

Carbadox

Carbadox is approved for use in swine weighing less than 75 pounds to prevent or treat enteritis and for increased feed efficiency and weight gain. The last exposure of swine to carbadox must be at least 10 weeks before slaughter (withdrawal period). The parent compound is a liver carcinogen. Domestic market hogs, boars, and sows will be monitored for carbadox.

As carbadox is approved in other countries for use with swine, it is included in the import plan for fresh pork. Confirmation depends upon an evaluation of the mass spectrometry (MS) confirmatory procedure (based upon a determinative extract for the carbadox metabolite), expected to be completed in early 1987. (Note the asterisks in pertinent tables.)

Carbamates

Carbamates are primarily systemic insecticides and acaricides but are also used extensively as soil treatments and as topical and knockdown agents for ectoparasites and other pests. Carbamates are generally neurotoxic, since they are cholinesterase inhibitors. Symptoms of toxicity include nausea, vomiting, diarrhea, and dyspnea.

Analysis for carbamates is a new procedure for the National Residue Monitoring Program in 1987. Technology is available to analyze samples for aldicarb, carbaryl, and carbofuran. The carbamates method is scheduled for completion in January 1987, and final method performance data will be determined at that time (note asterisks in pertinent tables). When established, this technology may be extended to include other carbamates.

During 1987, 900 domestic samples from bulls and cows, swine, and ducks will be analyzed for these carbamates.

Chloramphenicol

Chloramphenicol is a potent, rapidly metabolized, and toxic antibiotic with a wide spectrum of effectiveness. Chloramphenicol is not approved for use in food-producing animals and in humans because of its idiosyncratic production of fatal aplastic anemia in people. Current analytical methodology is effective in finding chloramphenicol concentrations of 10 ppb, but is not effective in finding metabolites of the compound. New methodology is being evaluated and adopted

that may be more sensitive in identifying chloramphenicol. By 1988 it may be possible to screen urine in the plant for chloramphenicol and then confirm the presence of these compounds by laboratory analysis. Such a system may be considerably more sensitive and efficient than current methodology.

During 1987 samples from imported product will be monitored. Domestically, special and regular surveillance and exploratory projects will be conducted to develop and evaluate the new methodology and to examine carefully selected animal populations that may have a risk of contamination with chloramphenicol.

Chlorinated Hydrocarbons (CHC)

FSIS laboratories use multi-residue screening and confirmatory analytical procedures to identify aldrin, endrin, dieldrin, BHC, chlordane, heptachlor and heptachlor epoxide, DDE, DDT, TDE, HCB, lindane, methoxychlor, nonachlor, PCB's, mirex, terpene polychlorinates, and toxaphene. Most of these compounds are potent and persistent pesticides whose use has been discontinued or severely restricted because of their suspected carcinogenicity in some species, their effect on egg shell production (especially in predatory fowl), and their characteristic propensity to accumulate in the food chain. These compounds generally induce microsomal epoxidation systems that are among the avian and mammalian defense mechanisms against several classes of toxicants. Accumulation of these compounds in body fat may result in concentrations 10 to 30 times as great as in the food supply. Metabolism and excretion are slow, and the biological half-life of these compounds may be several months in mammals and several years in arid soils. Their persistence and potency contributed greatly to their effectiveness as long-term insecticides, especially in the control of arthropod-borne disease, and also cause their continuing though diminishing occurrence as residues in meat and poultry products.

During 1987, analysis for residues of chlorinated hydrocarbons is planned for all domestic and imported species and production classes. Domestic activities include 150 area monitoring samples in Puerto Rico, in fulfillment of a commitment to Puerto Rican authorities to increase monitoring.

Clorsulon

Clorsulon, approved in 1985, is the only drug approved for the treatment of fascioliasis in cattle. Unlike albendazole, whose temporary use was withdrawn in 1985, clorsulon is not an effective treatment for helminths (intestinal or pulmonary). It is administered orally, and the last dose must be at least eight days before slaughter (withdrawal period). As there currently are no residue data for clorsulon in milk, it is not approved for use in dairy cows. As with albendazole, there is some concern about the health effects of clorsulon (blood dyscrasias have been observed in experimental animals).

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

During 1986, domestic samples from bulls and cows, heifers and steers, sheep, lambs, and goats will be analyzed for residues of clorsulon. As practical, analysis for clorsulon will be directed to samples collected from areas with endemic fascioliasis.

Clorsulon may be used in other countries where fascioliasis is endemic. Thus clorsulon will be included in the import plan.

Cyromazine

Cyromazine (Larvadex) is an insect growth regulator that is highly effective in preventing the development of *diptera* larvae in livestock and poultry manure; it is recommended for use in poultry feed to control flies in the droppings of laying hens. In the U.S., cyromazine is approved for use in laying hens only, but it is used in livestock in some countries. High doses of a metabolic breakdown product of cyromazine, melamine, resulted in bladder tumors in rats. However, these tumors are thought to result from mechanical irritation caused by bladder stones formed at high levels of exposure, and not from the intrinsic carcinogenicity of melamine.

In 1985, current analytical methodology was reevaluated at a considerably lower limit of sensitivity and installed in the Field Services Laboratories. During 1986 testing with the new technology was started in cattle and chickens at the lower detection limit and in 1987 will be expanded to include sheep and goats. Samples in 1987 will be collected only during the fly season, from February through November in the Southeastern and Southwestern regions, from March through September in the Western region, and from May through September in the Northeastern and North Central regions.

Cyromazine is included in the import plan for fresh-frozen beef, mutton, and lamb, as the compound may be used in some countries.

Decoquinate

Decoquinate is a coccidiostat approved for use in cattle and chickens. It is often used with an antibiotic or arsenical compound. Decoquinate is prohibited from use in laying hens, dairy cows, and breeding animals, and its use in broilers (young chickens) is minimal because of the availability of alternate compounds. During 1986 the monitoring plan included analysis of samples collected from domestic cattle and broilers for decoquinate. The 1987 plan for decoquinate analysis will continue the 1986 activities and further includes sampling in imported beef. This sampling activity is part of a cyclic check program.

DES, Zeranol, and Other Estrogenic Compounds

DES and zeranol are estrogenic compounds. Estrogenic compounds are used to increase feed efficiency and the rate of weight gain. DES was banned from use in 1979 when it was linked to cancer in humans. Some illegal use was detected in fancy veal calves in 1981. Zeranol is approved for use in cattle 65 or more days before slaughter.

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

All externally administered estrogenic compounds (including DES and zeranol) will cause characteristic histopathologic changes in the prostate in immature males that may be identified by histopathologic examination.

Before 1986, FSIS analyzed samples collected from mature cattle and calves for DES or zeranol by separate analytical procedures. During 1986 these procedures were combined and the screening program for estrogenic effects in the prostate of calves was approved; sampling procedures were changed accordingly. In 1987 the current procedure will be as follows:

1. Tissues from domestic heifers and steers will be analyzed for DES and zeranol by the combined analytic method currently in use.

2. Screening for estrogenic effects in the prostate will be increased in calves and will be initiated in lambs. When the prostate is collected, the liver will be collected from the same animal, frozen, and held in reserve.

3. When a prostate contains histopathologic evidence of estrogenic effects, the reserved liver tissue from that animal will be analyzed for DES and zeranol.

Domestic calves, sheep, and lambs will be monitored for estrogenic compounds in 1987 (including 50 area monitoring samples in Puerto Rico, in fulfillment of a commitment to Puerto Rican authorities to increase monitoring). Domestic heifers and steers will be monitored for DES/zeranol; in addition, 50 area monitoring samples from young chickens in Puerto Rico will be tested. Imported beef, veal, mutton, and lamb will be sampled for DES/zeranol.

Halofuginone

Halofuginone is a coccidiostat for broilers (young chickens). In higher doses halofuginone is a growth depressant, impairs feed utilization, and reduces feed intake. In rats it causes alopecia. The compound is prohibited from use during the last four days before slaughter (withdrawal period). During 1986 samples were analyzed for halofuginone for the first time. This sampling program will be continued through 1987.

Ipronidazole

Ipronidazole is approved for use domestically to control blackhead in turkeys and in other countries to treat or prevent enteritis in swine. Although ipronidazole is not approved for use in swine in the United States, some misuse in swine may occur in the U.S. and thus could result in unacceptable residues. Ipronidazole is prohibited from use during the last four days before slaughter (withdrawal period). It is a suspect carcinogen in experimental animals.

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

In 1987, samples from ipronidazole will be collected from imported fresh-frozen swine and turkeys. Ipronidazole will be monitored in domestic market hogs and young turkeys.

Ivermectin

Ivermectin is a macrocyclic lactose compound active at extremely low dosage against a wide variety of nematode and arthropod parasites. It is used for treatment of internal parasites. Ivermectin is teratogenic in the rat, rabbit, and mouse. FSIS plans to monitor domestically for residues of this drug in livestock.

Melengestrol acetate

Melengestrol acetate (MGA) is a progestational agent added to the feed of heifers to supress estrus and thereby achieve an increase in feed efficiency and the rate of weight gain. It is regulated as a suspect carcinogen in feedlot heifers. Because of its suspected carcinogenicity, samples will be collected from heifers during 1987 and analyzed for MGA. Imported beef samples will be monitored for MGA. Confirmation depends upon the evaluation of the mass spectrometry (MS) confirmatory procedure plus additional clean-up for MGA, to be completed in early 1987 (note asterisks in pertinent tables).

Organophosphates

Organophosphate insecticides are widely used in crop production to combat a diversified group of insects. They are also used in topical treatments of animals to control grubs and flies and are approved for use as animal drugs to control gastrointestinal roundworms.

The organophosphates generally are far less persistent than the chlorinated hydrocarbon insecticides, although withdrawal periods are required after direct treatment of animals. The primary toxic effect of concern is the inhibition of cholinesterase, a key enzyme in regulating the nervous system.

Previous domestic monitoring, which has involved analysis of liver tissue from all species, has not shown any problems. In 1987 the chlorinated hydrocarbon method will be modified slightly to allow for the detection of a group of chlorinated organophosphates in fat as well as chlorinated hydrocarbons. With no additional sample collection, the domestic samples tested for chlorinated hydrocarbons will yield an equal number of results for certain chlorinated organophosphates. (Note asterisks in pertinent tables.) The chlorinated organophosphates determined will include carbophenothion, chlorpyrifos, coumaphos, crufomate, dichlorvos, and ronnel. This change in testing procedure will allow FSIS to determine for the first time whether some of these commonly used organophosphates are present in fat. The chlorinated organophosphate procedure will begin in July.

Included in the domestic organophosphate plan will be 75 area monitoring samples in Puerto Rico, in fulfillment of a commitment to Puerto Rican authorities to increase monitoring.

The traditional organophosphate procedure will be performed for import muscle tissue samples, as the chlorinated organophosphate procedure does not work with low-fat samples.

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Sulfonamides

Sulfonamides are bacterial and protozoal supressant agents that have been widely used in animals and humans since the early 1940's. They continue to enjoy widespread popularity because of considerable clinical experience with them and their economic advantages and wide spectrum of activity. Toxic effects include renal damage, thyroid degeneration, and allergy. FSIS uses a multi-residue method of analysis for sulfonamides that can determine residues of sulfabromomethazine, sulfachloropyridazine, sulfadimethoxine, sulfaethoxypyridazine, sulfamethazine, sulfamethoxypyridazine, sulfapyridine, sulfaquinoxaline, and sulfathiazole.

In addition to national domestic monitoring samples planned for 1987 in all relevant species/production groups, additional area monitoring samples will be collected from market hogs in selected states on a rotational basis to gain additional information on the extent of the problem in those states. This special program, initiated in 1986 and continuing through 1987, will focus on states with a high volume of hog slaughter.

During 1987 major efforts will be made to complete development of an intensive in-plant testing program to reduce the level of violative residues of sulfonamides in swine carcasses; these efforts will include field trials of methods planned for use by inspectors at slaughtering establishments. The exploratory sample units listed for domestic swine in the respective tables are estimates of the sample units required to complete these field trials.

Also, in fulfillment of a commitment to Puerto Rican authorities to increase monitoring, additional samples are planned for heifers and steers (50), market hogs (25), boars and sows (25), and young chickens (200).

In the import plan, all commodities will be sampled for sulfonamide testing.

Trace Elements

The trace elements included in the multi-residue method used for monitoring are listed in Table I. The presence of these elements in animal tissues could result from either the natural background levels found in the environment or food chain, or from industrial contamination.

The trace elements show diverse toxicity. Due to the infrequent occurrence of high levels in normal animals, regulatory action levels or tolerances have not been found necessary for red meat and poultry. Exploratory sampling for trace elements is conducted periodically in order to verify that their presence in animal-derived food does not endanger human health.

In 1987 imported pork will be sampled in an exploratory project for trace elements. This project is part of a cyclic check program.

Table I

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan[1]
Albendazole	A-2	Albendazole
Aldicarb	A-4	Carbamates
Aldrin	A-3	Chlorinated Hydrocarbons (CHC's)
Amoxicillin trihydrate	B	Antibiotics
Ampicillin	B-2	Antibiotics
Apramycin	D	Apramycin
Arsanilate sodium	A	Arsenic
Arsanilic acid	C-1	Arsenic
Arsenate, calcium	C	Arsenic
Arsenate, copper	D	Arsenic
Arsenate, lead	D	Arsenic
Arsenate, magnesium	D	Arsenic
Arsenate, sodium	D	Arsenic
Arsenic	A	Arsenic
Bacitracin methylene disalicylate	C	Antibiotics
Bacitracin zinc	C	Antibiotics
BHC	B-2	Chlorinated Hydrocarbons (CHC's)
Cadmium	B-4	Trace Elements
Carbadox	A-3	Carbadox
Carbarsone	C-2	Arsenic
Carbaryl	D	Carbamates
Carbofuran	C-3	Carbamates
Carbophenothion	D	Organophosphates

[1]For planning, FSIS uses a residue term signifying the compound or group detected by the method used for a planned sample set.

Table I

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan[1]
Chloramphenicol	A-2	Chloramphenicol
Chloramphenicol palmitate	A-2	Chloramphenicol
Chlordane (technical)	A-2	Chlorinated Hydrocarbons (CHC's)
2-Chloro-1,(2,4,5-trichlorophenyl)-vinyl dimethyl phosphate (Gardona)	A	Organophosphates
Chlorpyrifos	B-4	Organophosphates
Chlortetracycline bisulfate	A	Antibiotics
Chlortetracycline hydrochloride	A	Antibiotics
Clorsulon	D	Clorsulon
Cloxacillin, benzathine	B	Antibiotics
Cloxacillin, sodium	B	Antibiotics
Cobalt	D	Trace Elements
Copper	D	Trace Elements
Coumaphos and oxygen analog	A	Organophosphates
Crufomate	B	Organophosphates
Cyromazine	D	Cyromazine
DDE (metabolite of DDT)	A	Chlorinated Hydrocarbons (CHC's)
DDT	A	Chlorinated Hydrocarbons (CHC's)
Decoquinate	Z-4	Decoquinate
Dichlorvos	B-4	Organophosphates
Dieldrin	A	Chlorinated Hydrocarbons (CHC's)
O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate	D	Organophosphates
O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate	D	Organophosphates

[1]For planning, FSIS uses a residue term signifying the compound or group detected by the method used for a planned sample set.

Table I

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan[1]
Diethylstilbestrol	D	DES/Zeranol
Dihydrostreptomycin	D	Antibiotics
Dioxathion	D	Organophosphates
Dodecachloro-octahydro-1, 3,4,-metheno-2H-cyclobuta [cd]pentalene (mirex)	A	Chlorinated Hydrocarbons (CHC's)
Endrin	A-3	Chlorinated Hydrocarbons (CHC's)
Erythromycin	A	Antibiotics
Erythromycin phosphate	A	Antibiotics
Erythromycin thiocyanate	A	Antibiotics
Estradiol benzoate	A	Estrogenic Compounds
Estradiol monopalmitate	A	Estrogenic Compounds
Ethion and oxygen analog	B	Organophosphates
Fenbendazole	B-3	Benzimidazoles
Fenitrothion	D	Organophosphates
Fenthion	C-3	Organophosphates
Gentamicin sulfate	B-2	Antibiotics
Halofuginone	D	Halofuginone
HCB	D	Chlorinated Hydrocarbons (CHC's)
Heptachlor and heptachlor epoxide	A-1	Chlorinated Hydrocarbons (CHC's)
Hetacillin, potassium	B	Antibiotics
Ipronidazole	Z-4	Ipronidazole
Ipronidazole hydrochloride	Z-4	Ipronidazole
Iron	D	Trace Elements

[1]For planning, FSIS uses a residue term signifying the compound or group detected by the method used for a planned sample set.

Table I

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan[1]
Ivermectin	B-1	Ivermectin
Lead	B-4	Trace Elements
Lindane	A-2	Chlorinated Hydrocarbons (CHC's)
Malathion	B	Organophosphates
Manganese	D	Trace Elements
Mebendazole	B-4	Benzimidazoles
Melengestrol acetate	A	Melengestrol acetate
Methanearsonic acid	D	Arsenic
Methoxychlor	D-4	Chlorinated Hydrocarbons (CHC's)
Methyl parathion	D	Organophosphates
Neomycin sulfate	B-3	Antibiotics
Nequinate	D	Decoquinate
Nickel	D	Trace Elements
Nonachlor	D	Chlorinated Hydrocarbons (CHC's)
Oxfendazole	D	Benzimidazoles
Oxytetracycline hydrochloride	A	Antibiotics
Parathion	D	Organophosphates
PCB's	A-4	Chlorinated Hydrocarbons (CHC's)
Penicillin, procaine and procaine G	A	Antibiotics
Penicillin G (benzathine, free acid, sodium salt, and procaine salts)	A	Antibiotics

[1]For planning, FSIS uses a residue term signifying the compound or group detected by the method used for a planned sample set.

Table I

COMPOUNDS INCLUDED IN THE 1987 RESIDUE PLAN

Compound(s)	Ranking	Residue Designation Used in Plan[1]
Ronnel	B	Organophosphates
Roxarsone	C-1	Arsenic
Streptomycin	A-3	Antibiotics
Sulfabromomethazine sodium	C	Sulfonamides
Sulfachloropyridazine	A	Sulfonamides
Sulfadimethoxine	A	Sulfonamides
Sulfaethoxypyridazine	A	Sulfonamides
Sulfamethazine	B-1	Sulfonamides
Sulfamethoxypyridazine	D	Sulfonamides
Sulfapyridine	D	Sulfonamides
Sulfaquinoxaline	B-1	Sulfonamides
Sulfathiazole	B-1	Sulfonamides
TDE (metabolite of DDT)	A	Chlorinated Hydrocarbons (CHC's)
Terpene polychlorinates	A	Chlorinated hydrocarbons (CHC's)
Tetracycline hydrochloride	B-3	Antibiotics
Thiabendazole	B-2	Benzimidazoles
Toxaphene	A-2	Chlorinated Hydrocarbons (CHC's)
Trichlorfon	B-3	Organophosphates
Tylosin	Z-3	Antibiotics
Zeranol	C-2	DES/Zeranol
Zinc	D-4	Trace Elements

[1]For planning, FSIS uses a residue term signifying the compound or group detected by the method used for a planned sample set.

Table II

SPECIES GROUPS FOR RESIDUE EVALUATION

Species/Production Classes	Apportionment	Minimum Sample Units Analyzed Per Year
Horses		300
Bulls/Cows	(10%/90%)	300
Heifers/Steers	(40%/60%)	300
Calves		
Bob Veal		300
Fancy Veal		300
Other		300
Sheep/Lamb (Seasonal)	(10%/90%)	200
Goats		100
Hog, market		300
Sows/Boars	(80%/20%)	300
Chickens, young		300
Chickens, mature		300
Turkeys, young[1] (Seasonal)		300
Turkeys, mature[2] (Seasonal)		300
Ducks		300
Geese (Seasonal)		100
Rabbits		100

[1]Normally 16 weeks old.
[2]Breeding stock.

Table III

95 PERCENT CONFIDENCE INTERVALS FOR THE PERCENTAGE OF VIOLATIONS IN THE POPULATION

	NUMBER OF VIOLATIONS												
Sample Size	0	1	2	3	4	5	7	10	15	20	30	40	50
50	0.0-5.82												
100	0.0-2.95												
150	0.0-1.98												
300	**0.0-0.99**	0.01-1.84	0.08-2.39	0.21-2.89	0.36-3.38	.53-3.88	.93-4.77	1.60-6.07	2.82-8.13	4.12-10.12	6.85-13.98	9.71-17.72	12.69-21.39
500	0.0-0.60	**0.01-1.11**											
600	0.0-0.50		**0.4-1.20**										
800	0.0-0.37			**0.08-1.09**									
900	0.0-0.33				**0.12-1.13**	.18-1.30	.31-1.60	.53-2.04	.93-2.74	1.36-3.42	2.26-4.73	3.19-6.01	4.15-7.26

Table IV

TARGET SAMPLE TISSUES TO BE COLLECTED FOR ANALYSIS

Residue Designation	Species Sampled	Tissue Analyzed[1]
Albendazole	Cattle Goats Sheep	**Liver**, muscle
Antibiotics	Cattle Chickens Ducks Geese Goats Horses Rabbits Sheep Swine Turkeys	**Kidney**, liver, muscle
Arsenic	Chickens Horses Swine Turkeys	**Liver**, muscle
Benzimidazoles	Cattle Sheep Swine	**Liver**, muscle
Carbadox	Swine	**Liver**, muscle
Carbamates	Cattle Ducks Swine	**Liver**, muscle
Chloramphenicol	Cattle Sheep Swine	**Kidney**, muscle (domestic) **Muscle** (imports)
Chlorinated Hydrocarbons	Cattle Chickens Ducks Geese Goats Horses Rabbits Sheep Swine Turkeys	**Fat**
Clorsulon	Cattle Goats Sheep	**Kidney**, muscle

[1]Tissues in bold-face type submitted for monitoring samples; if more than one target tissue, all tissues submitted for surveiliance samples.

Table IV

TARGET SAMPLE TISSUES TO BE COLLECTED FOR ANALYSIS

Residue Designation	Species Sampled	Tissue Analyzed[1]
Cyromazine	Cattle Chickens Goats Sheep	**Muscle**
Decoquinate	Cattle Chickens	**Liver**, muscle
DES/Zeranol	Cattle Chickens Sheep	**Liver**, muscle
Estrogenic Compounds/ Histopathologic Screening	Cattle (Male) Sheep (Male)	**Prostate gland**[2], liver
Halofuginone	Chickens	**Liver**, muscle
Ipronidazole (Hydroxy)	Swine Turkeys	**Muscle**
Ivermectin	Cattle Goats Horses Sheep Swine	**Liver**, muscle
Melengestrol acetate	Cattle	**Fat**, muscle
Organophosphates (imports)	Cattle Sheep	**Muscle**
Organophosphates (domestic)	Cattle Chickens Ducks Geese Goats Horses Rabbits Sheep Swine Turkeys	**Fat**
Sulfonamides	Cattle Chickens Ducks Geese Goats Horses Rabbits Sheep Swine Turkeys	**Liver**, muscle

[1]Tissues in bold-face type submitted for monitoring samples; if more than one target tissue, all tissues submitted for surveillance samples.
[2]Companion liver will be analyzed if positive.

Table IV

TARGET SAMPLE TISSUES TO BE COLLECTED FOR ANALYSIS

Residue Designation	Species Sampled	Tissue Analyzed[1]
Trace Elements (imports)	Swine	**Muscle**

[1]Tissues in bold-face type submitted for monitoring samples; if more than one target tissue, all tissues submitted for surveillance samples.

Table V

DOMESTIC AND IMPORT RESIDUE SAMPLES TO BE ANALYZED IN 1987

Residue Designation	Domestic Samples	Import Samples	Totals
Albendazole	700	400	1,100
Antibiotics	18,050	2,000	20,050
Arsenic	1,200	300	1,500
Benzimidazoles	1,500	600	2,100
Carbadox	600	300	900
Carbamates	900	—	900
Chloramphenicol	500	1,000	1,500
Chlorinated Hydrocarbons	4,950	3,600	8,550
Clorsulon	900	300	1,200
Cyromazine	900	300	1,200
Decoquinate	600	300	900
DES/Zeranol	700	200	900
Estrogenic Compounds (Histopathologic Screening)	950	—	950
Halofuginone	300	—	300
Ipronidazole	400	600	1,000
Ivermectin	1,800	—	1,800
Melengestrol Acetate	300	200	500
Organophosphates	2,725	500	3,225
Sulfonamides	8,400	2,500	10,900
Trace Elements	—	100	100
TOTALS	**46,375**	**13,200**	**59,575**

Table VI

DOMESTIC AND IMPORT SAMPLE UNIT ANALYSES

Residue Designation	Total Sample Unit Analyses	Estimated Lab Time Per Sample Unit (Hours)[1]	Estimated Total Lab Time (x 100 Hours)
Albendazole	1,100	1.20	13.20
Antibiotics	20,050	0.55	110.28
Arsenic	1,500	0.51	7.65
Benzimidazoles	2,100	4.30	90.30
Carbadox	900	3.00	27.00
Carbamates	900	2.00	18.00
Chloramphenicol	1,500	0.55	8.25
Chlorinated Hydrocarbons	8,550	0.92	78.66
Clorsulon	1,200	1.50	18.00
Cyromazine (Seasonal/Area)	1,200	2.00	24.00
Decoquinate	900	1.26	11.34
DES/Zeranol	900	1.00	9.00
Estrogenic Compounds (Histopathologic Screening)	950	1.00	9.50
Halofuginone	300	6.01	18.03
Ipronidazole	1,000	2.00	20.00
Ivermectin	1,800	2.00	36.00
Melengestrol Acetate	500	3.00	15.00
Organophosphates	500	3.89	19.45
Organophosphates (Chlorinated)	2,725	0.10	2.73
Sulfonamides	10,900	0.95	103.55
Trace Elements	100	1.04	1.04
TOTALS	**59,575**		**640.98**

[1]Estimate of analyst time; does not include administrative, inspector, or other nonanalytical staff hours required.

Table VII

DOMESTIC RESIDUE PLAN 1987
SAMPLE UNIT ANALYSES

Residue Designation	Monitoring	Surveillance	Exploratory	Total
Albendazole	700	—	—	700
Antibiotics	8,150	2,900	—	11,050
STOP	—	3,000*	—	3,000
CAST	—	4,000*	—	4,000
Arsenics	1,200	—	—	1,200
Benzimidazoles	1,500	—	—	1,500
Carbadox	600	—	—	600
Carbamates	900	—	—	900
Chloramphenicol	—	500	—	500
Chlorinated Hydrocarbons	4,450	500	—	4,950
Clorsulon	900	—	—	900
Cyromazine	900	—	—	900
Decoquinate	600	—	—	600
DES/Zeranol	700	—	—	700
Estrogenic Compounds (Histopathologic Screening)	950	—	—	950
Halofuginone	300	—	—	300
Ipronidazole	400	—	—	400
Ivermectin	1,800	—	—	1,800
Melengestrol Acetate	300	—	—	300
Organophosphates	2,225	500	—	2,725
Sulfonamides	7,400	500*	500*	8,400
TOTALS	**33,975**	**11,900**	**500**	**46,375**

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table VIII

DOMESTIC MONITORING AND EXPLORATORY SAMPLE UNIT ANALYSES: LIVESTOCK

Residue Designation	Horses	Bulls/ Cows	Heifers/ Steers	Calves			Sheep/ Lamb	Goats	Market Hogs	Boars/ Sows	Total
				Bob	Fancy	Other	Seasonal				
Albendazole	—	—	300	—	—	—	300*	100*	—	—	700
Antibiotics	300	300	300	300	1,800*	300	100	1,000	300	5,000	
Aged Animals	—	300	—	—	—	—	300	—	—	300	900
Area	—	50	—	—	—	—	—	—	25	25	100
Arsenic	300	—	—	—	—	—	—	—	300	—	600
Benzimidazoles	—	300	300	—	300	—	300*	—	300*	—	1,500
Carbadox	—	—	—	—	—	—	—	—	300	300	600
Carbamates	—	300*	—	—	—	—	—	—	—	300*	600
Chlorinated Hydrocarbons	300	300	400	300	300	300	300	300	300	600	3,400
Area	—	50	—	—	—	—	—	—	25	25	100
Clorsulon	—	300	300	—	—	—	200	100	—	—	900
Cyromazine*	—	—	300	—	—	—	200	100	—	—	600
Decoquinate	—	—	300	—	—	—	—	—	—	—	300
DES/Zeranol	—	—	600	—	—	—	—	—	—	—	600
Area	—	—	50	—	—	—	—	—	—	—	50
Estrogenic Compounds (Histopathologic Screen)	—	—	—	—	600	—	300	—	—	—	900
Area	—	—	—	—	50*	—	—	—	—	—	50
Ipronidazole	—	—	—	—	—	—	—	—	300	—	300
Ivermectin	100	300	300	—	300	—	100	100	300	300	1,800
Melengestrol Acetate	—	—	300*	—	—	—	—	—	—	—	300
Organophosphates	150	150	200	150	150	150	150	150	150	300	1,700
Area	—	25	—	—	—	—	—	—	—	25	50
Sulfonamides	100	300	100	300	300	300	100	100	1,200	600	3,400
Area	—	—	50	—	—	—	—	—	1,825	25	1,900
Exploratory	—	—	—	—	—	—	—	—	500	—	500
Totals	**1,250**	**2,675**	**3,800**	**1,050**	**3,800**	**1,050**	**2,550**	**1,050**	**5,525**	**3,100**	**26,850**

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table IX

DOMESTIC MONITORING AND EXPLORATORY SAMPLE UNIT ANALYSES: POULTRY AND RABBITS

Residue Designation	Chickens Young	Chickens Mature	Turkeys Young Seasonal	Turkeys Mature Seasonal	Ducks	Geese Seasonal	Rabbits	Total
Antibiotics	100	300	300	300	100	100	300	1,500
Aged Animals	—	300	—	300	—	—	—	600
Area	50	—	—	—	—	—	—	50
Arsenic	300	—	300	—	—	—	—	600
Carbamates	—	—	—	—	300	—	—	300
Chlorinated Hydrocarbons	100	100	100	100	100	100	300	900
Area	50	—	—	—	—	—	—	50
Cyromazine*	—	300	—	—	—	—	—	300
Decoquinate	300	—	—	—	—	—	—	300
DES/Zeranol	—	—	—	—	—	—	—	0
Area	50	—	—	—	—	—	—	50
Halofuginone	300	—	—	—	—	—	—	300
Ipronidazole	—	—	100	—	—	—	—	100
Organophosphates	50	50	50	50	50	50	150	450
Area	25	—	—	—	—	—	—	25
Sulfonamides	1,000	—	300	300	100	100	100	1,900
Area	200	—	—	—	—	—	—	200
Totals	**2,525**	**1,050**	**1,150**	**1,050**	**650**	**350**	**950**	**7,625**

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table X

ESTIMATED IMPORT SAMPLE UNIT ANALYSES—1987

Residue Designation	Monitoring	Surveillance	Exploratory	Total
Albendazole	400	—	—	400
Antibiotics	2000	—	—	2000
Arsenic	300	—	—	300
Benzimidazoles	600	—	—	600
Carbadox	300	—	—	300
Chloramphenicol	1000	—	—	1000
Chlorinated Hydrocarbons	3600	—	—	3600
Clorsulon	300	—	—	300
Cyromazine	300	—	—	300
Decoquinate	300	—	—	300
DES/Zeranol	200	—	—	200
Ipronidazole	600	—	—	600
Melengestrol Acetate	200	—	—	200
Organophosphates	500	—	—	500
Sulfonamides	2500	—	—	2500
Trace Elements	—	—	100	100
TOTAL	**13100**	**—**	**100**	**13200**

Table XI

ESTIMATED IMPORT SAMPLE UNIT ANALYSES—1987

Residue Designation	Beef	Pork	Veal	Mutton/Lamb	Poultry	Totals
Albendazole	300*	—	—	100*	—	400
Antibiotics	1,000	600	300	100	—	2,000
Arsenic	—	150	—	—	150	300
Benzimidazoles	200	200*	—	200*	—	600
Carbadox	—	300	—	—	—	300
Chloramphenicol	300	300	300	100	—	1,000
Chlorinated Hydrocarbons	2,200	1,000	150	100	150	3,600
Clorsulon	300	—	—	—	—	300
Cyromazine	150	—	—	150	—	300
Decoquinate	300	—	—	—	—	300
DES/Zeranol	60	—	70	70	—	200
Ipronidazole	—	540	—	—	60	600
Melengestrol Acetate	200	—	—	—	—	200
Organophosphates	300	—	—	200	—	500
Sulfonamides	700	1,200	300	100	200	2,500
Trace Elements	—	100	—	—	—	100
Total	6,010	4,390	1,120	1,120	560	13,200

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table XII

ESTIMATED IMPORT SAMPLES PER COUNTRY FOR ANALYSIS—1987

Country	Beef	Pork	Veal	Mutton/Lamb	Poultry*	Totals
Argentina	340	—	—	—	—	340
Australia	1,158	153	303	355	—	1,969
Belize	102	—	—	—	—	102
Belgium	—	145	—	—	—	145
Brazil	268	—	—	—	—	268
Canada	1,062	1,231	294	133	268	2,988
Costa Rica	389	—	—	—	—	389
Czechoslovakia	—	146	—	—	—	146
Denmark	165	987	156	—	—	1,308
Dominican Rep.	243	—	—	—	—	243
El Salvador	165	—	—	—	—	165
Finland	—	237	—	—	—	237
France	—	—	—	—	65	65
Germany	—	36	—	—	—	36
Guatemala	283	—	—	—	—	283
Honduras	202	—	—	—	—	202
Hong Kong	—	—	—	—	85	85
Hungary	—	221	—	—	—	221
Iceland	—	—	—	78	—	78
Ireland	175	—	—	—	—	175
Israel	—	—	—	—	142	142
Netherlands	—	201	—	—	—	201
New Zealand	897	67	367	554	—	1,885
Nicaragua	207	—	—	—	—	207
Panama	102	—	—	—	—	102
Poland	—	355	—	—	—	355
Romania	—	130	—	—	—	130
Sweden	173	108	—	—	—	281
Switzerland	—	16	—	—	—	16
Taiwan	—	133	—	—	—	133
Uruguay	79	—	—	—	—	79
Yugoslavia	—	224	—	—	—	224
TOTAL	**6,010**	**4,390**	**1,120**	**1,120**	**560**	**13,200**

*Includes chickens, turkeys, ducks, and geese.

Table XIII

SAMPLING RATES FOR IMPORTED PRODUCTS (INDIVIDUAL COUNTRY BASIS)

Monitoring Program Sampling

Pounds Exported/Yr.	*Total Samples/Yr.*
1-100,000 lbs.	8 samples
100,000-1,000,000 lbs.	8 plus 2 for each 100,000 lbs.
1,000,000-25,000,000 lbs.	35 plus 2 for each 1,000,000 lbs.
25,000,000-1,000,000,000 lbs.	85 plus 1 for each 1,000,000 lbs.
> 1,000,000,000 lbs.	200 plus 10 for each 100,000,000 lbs. Not to exceed 300 samples.

The above criteria are used as the starting point for import product sampling. The actual numbers arrived at are modified according to a compound's evaluation and ranking and FSIS laboratory capabilities.

Table XIV

ESTIMATED SAMPLE COLLECTION FOR IMPORTED BEEF

Country	Estimated Annual Imports (lbs)	Fresh Product (lbs)	Processed Product (lbs)
Argentina	100,598,970	—	100,598,970
Australia	581,423,937	580,367,683	1,056,254
Belize	146,901	146,901	—
Brazil	76,092,980	—	76,092,980
Canada	193,896,401	193,816,461	79,940
Costa Rica	51,834,911	51,834,911	—
Denmark	4,774,085	4,682,285	91,800
Dominican Republic	18,181,466	18,181,466	—
El Salvador	2,050,322	2,050,322	—
Guatemala	28,016,071	28,016,071	—
Honduras	13,653,563	13,653,563	—
Ireland	5,327,676	5,183,149	144,527
New Zealand	370,732,706	369,749,532	983,174
Nicaragua	9,485,146	9,485,146	—
Panama	117,802	117,802	—
Sweden	3,798,513	3,798,513	—
Uruguay	3,620,569	—	3,620,569

Table XV

IMPORTED BEEF MONITORING AND EXPLORATORY SAMPLE UNIT ANALYSES FOR FRESH (F) AND PROCESSED (P) PRODUCTS FOR 1987

Country	Albendazole*	Antibiotics	Benzimidazoles	Chloramphenicol	Chlorinated Hydrocarbons	Cyromazine	Clorsulon	Decoquinate	DES/Zeranol	Melengestrol Acetate	Organophosphates	Sulfonamides	Total Est. Samples
	F	F	F	F	F/P	F	F	F	F	F	F/P	F/P	
Argentina	—	—	—	—	250	—	—	—	—	—	—	90	340
Australia	94	183	52	94	300	30	94	94	30	—	94	93	1,150
Belize	8	8	8	8	30	8	8	8	—	—	8	8	102
Brazil	—	—	—	—	200	—	—	—	—	—	—	68	268
Canada	50	180	28	50	300	16	50	50	—	190	50	98	1,062
Costa Rica	16	110	10	16	125	8	16	16	—	—	16	56	389
Denmark	9	39	8	9	45	8	9	9	—	—	9	20	165
Dominican Republic	10	51	8	10	100	8	10	10	—	—	10	26	243
El Salvador	8	36	8	8	55	8	8	8	—	—	8	18	165
Guatemala	12	37	9	12	150	8	12	12	—	—	12	19	283
Honduras	9	47	8	9	70	8	9	9	—	—	9	24	202
Ireland	9	39	8	9	45	8	9	9	—	10	9	20	175
New Zealand	50	180	29	50	300	16	50	50	30	—	50	92	897
Nicaragua	9	44	8	9	80	8	9	9	—	—	9	22	207
Panama	8	8	8	8	30	8	8	8	—	—	8	8	102
Sweden	8	38	8	8	60	8	8	8	—	—	8	19	173
Uruguay	—	—	—	—	60	—	—	—	—	—	—	19	79
Total	**300**	**1000**	**200**	**300**	**2200**	**150**	**300**	**300**	**60**	**200**	**300**	**700**	**6010**

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table XVI

ESTIMATED SAMPLE COLLECTION FOR IMPORTED PORK

Country	Estimated Annual Imports (lbs)	Fresh Product (lbs)	Processed Product (lbs)
Australia	538,783	470,000	68,783
Belgium	1,930,259	—	1,930,259
Canada	417,194,049	414,305,340	2,888,709
Czechoslovakia	2,514,888	—	2,514,888
Denmark	335,971,451	133,792,691	202,178,760
Finland	3,382,356	3,382,356	—
Germany	407,981	—	407,981
Hungary	38,489,554	—	38,489,554
Netherlands	22,324,879	—	22,324,879
New Zealand	16,901	16,901	—
Poland	72,183,282	—	72,183,282
Romania	4,063,357	—	4,063,357
Sweden	652,087	—	652,087
Switzerland	107,118	—	107,118
Taiwan	1,359,428	—	1,359,428
Yugoslavia	19,933,193	—	19,933,193

Table XVII

IMPORTED PORK MONITORING AND EXPLORATORY SAMPLE UNIT ANALYSES FOR FRESH (F) AND/OR PROCESSED (P) PRODUCTS FOR 1987

Country	Antibiotics	Arsenic	Benzimidazoles*	Carbadox	Chloramphenicol	Chlorinated Hydrocarbons	Ipronidazole	Sulfonamides	Trace Elements	Total Est. Samples
	F	F/P	F	F	F/P	F/P	F	F/P	F/P	
Australia	20	8	16	8	16	16	45	16	8	153
Belgium	—	8	16	—	16	37	—	60	8	145
Canada	300	30	20	149	52	200	240	230	10	1231
Czechoslovakia	—	8	16	—	16	38	—	60	8	146
Denmark	220	25	20	110	42	180	180	200	10	987
Finland	50	8	—	25	16	39	60	39	—	237
Germany	—	—	—	—	8	14	—	14	—	36
Hungary	—	9	16	—	18	80	—	90	8	221
Netherlands	—	8	16	—	16	77	—	76	8	201
New Zealand	10	—	—	8	8	10	15	16	—	67
Poland	—	13	16	—	26	132	—	160	8	355
Romania	—	8	16	—	16	41	—	41	8	130
Sweden	—	8	16	—	16	20	—	40	8	108
Switzerland	—	—	—	—	—	8	—	8	—	16
Taiwan	—	8	16	—	16	35	—	50	8	133
Yugoslavia	—	9	16	—	18	73	—	100	8	224
Total	**600**	**150**	**200**	**300**	**300**	**1000**	**540**	**1200**	**100**	**4390**

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table XVIII

IMPORTED VEAL ESTIMATED SAMPLE UNIT ANALYSES FOR FRESH AND PROCESSED PRODUCT 1987

Country	Estimated Annual Imports (lbs)	Antibiotics	Chloramphenicol	Chlorinated Hydrocarbons	DES/Zeranol	Sulfonamides	Total Est. Samples
		F	F/P	F/P	F	F/P	
Australia	4,934,602	80	80	43	20	80	303
Canada	2,942,296	80	80	39	15	80	294
Denmark	909,720	40	40	21	15	40	156
New Zealand	11,428,102	100	100	47	20	100	367
Total		300	300	150	70	300	1,120

Table XIX

IMPORTED MUTTON AND LAMB SAMPLE UNIT ANALYSES FOR FRESH AND PROCESSED PRODUCT 1987

Country	Estimated Annual Imports (lbs)	Albendazole*	Antibiotics	Benzimidazoles*	Chloram-phenicol	Chlorinated Hydrocarbons	Cyromazine	DES/Zeranol	Organophosphates	Sulfonamides	Total Est. Samples
		F	F	F	F/P	F/P	F	F	F	F	
Australia	8,731,362	30	30	60	30	30	60	25	60	30	355
Canada	225,742	12	12	25	12	12	15	8	25	12	133
Iceland	79,140	8	8	15	8	8	—	8	15	8	78
New Zealand	28,887,250	50	50	100	50	50	75	29	100	50	554
Total		100	100	200	100	100	150	70	200	100	1,120

*See discussion under pertinent compound in "Compounds Included in the 1987 Residue Plan."

Table XX

IMPORTED DUCK/GEESE SAMPLE UNIT ANALYSES FOR FRESH AND PROCESSED PRODUCT 1987

Country	Estimated Annual Imports (lbs)	Chlorinated Hydrocarbons	Sulfonamides	Total Est. Samples
		F/P	F/P	
Canada	1,179,349	16	16	32
Total		16	16	32

Table XXI

IMPORTED TURKEY SAMPLE UNIT ANALYSES FOR FRESH AND PROCESSED PRODUCT 1987

Country	Estimated Annual Imports (lbs)	Arsenic	Chlorinated Hydrocarbons	Sulfonamides	Ipronidazole	Total Est. Samples
		F/P	F/P	F/P	F	
Canada	495,236	9	9	9	60	87
Total		9	9	9	60	87

Table XXII

IMPORTED POULTRY (CHICKEN) SAMPLE UNIT ANALYSES FOR FRESH AND PROCESSED PRODUCT 1987

Country	Estimated Annual Imports (lbs)	Arsenic	Chlorinated Hydrocarbons	Sulfonamides	Total Est. Analyses
		F/P	F/P	F/P	
Canada	3,282,867	47	42	60	**149**
France	575,559	18	18	29	**65**
Hong Kong	691,022	30	25	30	**85**
Israel	1,780,529	46	40	56	**142**
Total		141	125	175	**441**